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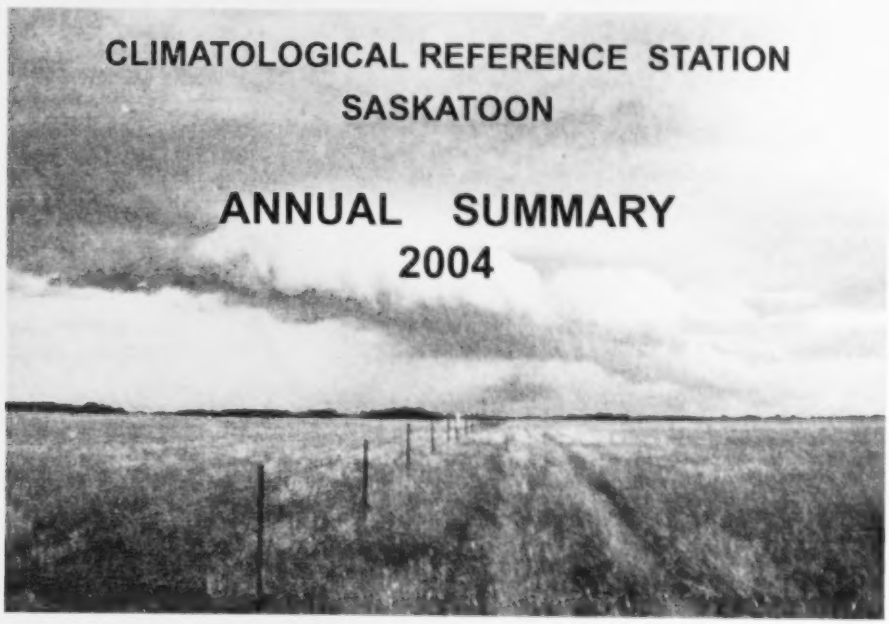
CLIMATOLOGICAL REFERENCE STATION SASKATOON

ANNUAL SUMMARY 2004



C. Beaulieu
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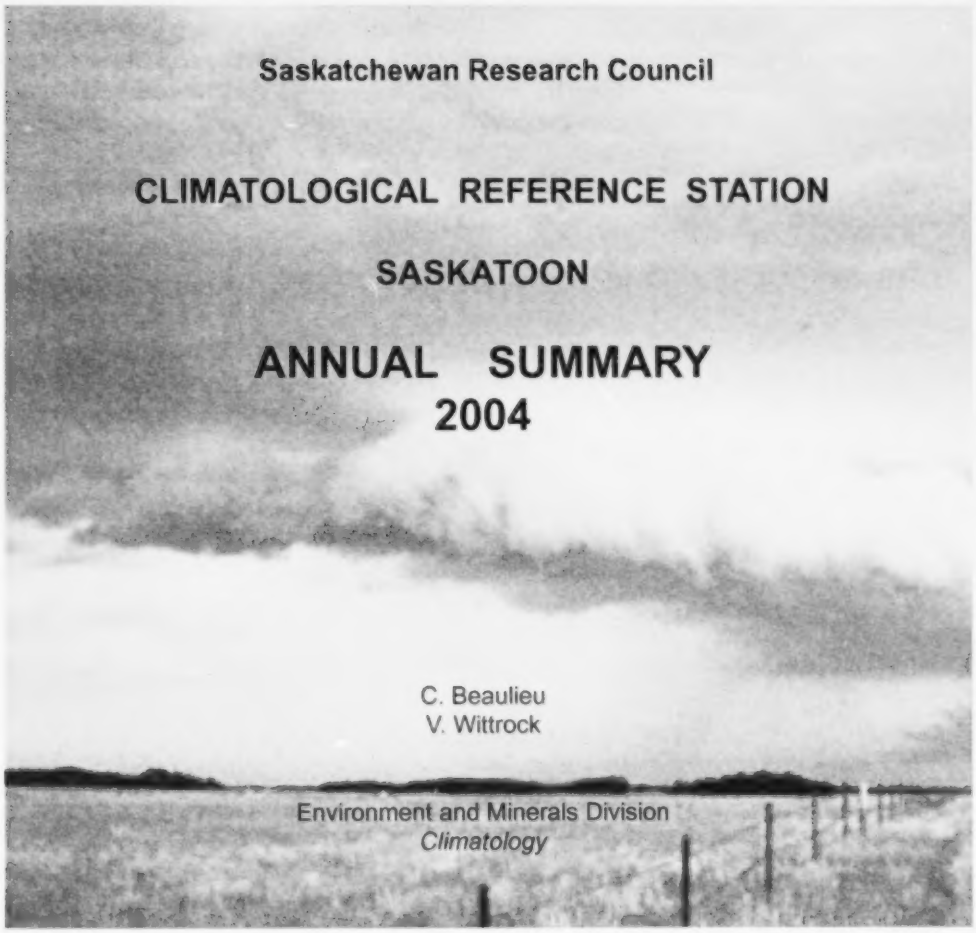
SRC Publication No. 10440-1E05

February 2005



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Although every caution has been taken to ensure the accuracy of data and information presented, errors may have occured. If errors are noticed, we would appreciate being informed so they can be corrected. Our data is subject to on-going quality assurance checks which may result in minor changes and updates to some values previously presented in past reports.

Information and data contained in this report shall not be published, copied, placed in a retrieval system or distributed whole or in part without prior written consent of the Saskatchewan Research Council. All references made to this report shall be acknowledged.

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COVER PHOTOGRAPH
Storm clouds on the Missouri Couteau between Birsay and Elbow which later produced funnel clouds, July 19, 2004
Photo credit: Bob Godwin, Ecosystems, SRC

TABLE OF CONTENTS

Acknowledgements ... ii
Climate Reference Station Sponsors, 2004 ... ii
Table of Contents ... iii
Climate Reference Station History ... 1
What is the Climate Reference Station? ... 2
Climate Reference Station Outreach 2004 ... 2
Summaries for 2004
Overview ... 3
Weather events summaries, 2004
New 2004 daily temperature and precipitation records ... 4
Greatest extreme precipitation events ... 4
Extreme temperature for 2004 ... 4
Extreme winds for 2004 ... 4
Temperature rankings ... 5
Dates of frost-free season ... 5
Precipitation Rankings ... 6
SRC Climate Reference Station temperature record for 2004 ... 7
SRC Climate Reference Station precipitation record for 2004 ... 8
Monthly summaries - tables and graphs
Monthly temperatures and extreme values for 2004 and average annual temperatures for CRS ... 9
Monthly precipitation and extreme values for 2004 and total annual precipitation for CRS ... 10
Monthly heating and cooling degree-days ... 11
Monthly growing degree-days ... 12
Potential Evapotranspiration (PET) for 2004 using the Thornthwaite Method ... 12
Daily global and diffuse solar radiation ... 13
Bright sunshine for 2004 and annual total bright sunshine ... 14
Sunrise and sunset at Saskatoon, 2004 and 2005 ... 15
Monthly average soil temperatures ... 16
Monthly average wind speed and extreme gusts ... 17
Windchill calculation chart ... 17
Annual weather summary ... 18
Monthly weather summaries ... 19
Instruments used at Saskatoon SRC CRS and Glossary of Terms ... 31
References and Bibliography ... 34

Climate Reference Station

Swainston's Hawk patroling the Climate Reference Station for a gopher snack, August 2004 (photo credit: CR Beaulieu, SRC)
Checking the New Jersey Light Trap for mosquitoes, August 2004 (photo credit: Rolf Jahren, SRC)

105-02928/

CLIMATE REFERENCE STATION HISTORY

Swainston's Hawk west of CRS, August 2004 photo credit: CR Beaulieu

Meteorological observations were first taken at or near Saskatoon by the Royal Northwest Mounted Police in 1889 with temperature only being recorded. There is some disagreement in the early records as to the exact location of the weather observing point, but the majority of the evidence indicates 52°15'N, 106°20'W, elevation 480m above sea level as the most probable location. This would place it at Clark's Crossing on the South Saskatchewan River, approximately 16 km northeast of the centre of the City of Saskatoon. There was a settlement at Clark's Crossing at that time as well as 10 to 15 families on either side of the river where Saskatoon is now located.

Little is known about the very early observers; however, the records do show that Major T.H. Keenan took observations from March 1892 until March 1895, and Mr. George Will was the observer from January 1897 until April 1897. It is thought that T. H. Copeland was involved in the observational program from 1895 to May 1, 1901, at which time it was taken over by Mr. Eby, Sr. Mr. Eby, Sr. recorded the observations until his death in 1921, at which time his daughter, Miss E.S. Eby, continued to record the observations. Her brother, Mr. J.M. Eby, recorded the observations beginning in April 1931 until the station was closed October 31, 1942. The Eby station recorded temperature, precipitation and weather notes on fog, thunderstorms, winds and any unusual weather phenomena. Reports were made twice daily, morning and evening.

In 1916, a climatological station was established by the Physics Department of the University of Saskatchewan and continuous observations were kept twice daily until January 15, 1965. The longtime observer was Mr. Sidney Cox. The Saskatchewan Research Council took over the programme in the fall of 1963 at the newly established Climatological Reference Station at latitude 52°09'N, longitude 106°36'W and elevation 497 m asl[1]. The first observer was Terry Beck followed three years later by Orville Olm.[2] In 1967, Joe Calvert became the primary observer until his retirement in 1983. Ray Begrand succeeded Mr. Calvert until 1988 when Virginia Wittrock became the primary observer. Since 1992, the primary observer has been Carol Beaulieu assisted by Virginia Wittrock, Leanne Crone and Charlene Hudym.

In the summer of 1992, the CRS began to be converted to an automated system of data collection with the installation of a Campbell Scientific data logger and automatic sensors. Elements presently recorded at the site are temperature, precipitation, wind, solar radiation, relative humidity, barometric pressure, soil temperature and snow-on-the-ground (manual recordings). Temperature, precipitation and radiation data are submitted to Environment Canada.

[1] *Christiansen 1970; Environment Canada 1975*
[2] *Olm 2001*

WHAT IS THE CLIMATE REFERENCE STATION?

The Saskatchewan Research Council's Climate Reference Station (SRC CRS) at Saskatoon is classified as a principal climatological station with supplementary climatological observations.[1] A reference climatological station's data are intended for the purpose of determining climatic trends. This requires long periods (not less than thirty years) of homogeneous records, where man-made environmental changes have been or are expected to remain at a minimum. Ideally the records should be of sufficient length to enable the identification of secular changes of climate[2]. At our station, hourly readings are taken of elements which include temperature, precipitation amount, humidity, wind, and atmospheric pressure. Our supplemental observations include rate of rainfall, soil temperature, bright sunshine and solar radiation. High quality and consistent climatological observations are maintained providing data sets to meet the current concerns of the effects of climatic change and increased variability.

Purpose and Benefits

The purpose of the SRC CRS is to provide a record of observed meteorological elements so that the climate of the area and its changes can be accurately documented and described. Climatological data have assumed new importance as a result of social and environmental issues in which climate is a dominant factor. Climatological information assists in realizing new technological opportunities and social changes. It is necessary and valuable for areas such as agriculture, forestry, land use and facility placement, water and energy resources, health and comfort.

The CRS also allows us to:

- evaluate long term climate trends - early warning system for increased frequencies of extreme events such as drought, floods, *etc.*;
- determine the impacts of climate events on society, economy, health, and ecosystems - *e.g.* intense rainfall causing flooding and property damage, heat stress with its implications for health, West Nile monitoring programme directed by Saskatchewan Health;
- do value-added research;
- be part of regional, national and global networks in an important agricultural and ecological area;
- facilitate development of additional programs - *e.g.* air quality, biodiversity, and climate change monitoring;
- have roles in various programs within SRC including spray drift work, The Boreal Ecosystem - Atmosphere Study (BOREAS), and collaborative research with the Western College of Veterinary Medicine and the College of Agriculture, University of Saskatchewan, for example; and
- provide climate data to governments, universities, insurance agencies, lawyers, agricultural sectors, chemical companies, schools, building science, construction firms, media, transportation studies, accident studies, wildlife studies, tourism groups and interested individuals.

Goals

The goals of the Climate Reference Station are first, to maintain the high quality of data gathered over its more than forty years of existence at its current location and, second, to continue to monitor a large variety of elements. These various elements combined with the long-term collection period as well as the stable location allow CRS to be a very valuable climate information collection station.

CLIMATE REFERENCE STATION OUTREACH 2004

Presentations to schools on weather instruments were supplimented in 2004 with a computer presentation on the climate of Saskatoon. Both were well received by students and staff with positive post-presentation feedback. Approximately 364 children from 12 schools, grades 1 to 6 participated in the outreach programme. Students received hands-on experience with the instruments used to measure temperature, precipitation, wind and solar radiation along with a better understanding of Saskatoon's climate; past, present and future.

CRS became part of in the West Nile virus mosquito monitoring programme directed by Saskatchewan Health. A New Jersey Light Trap, supplied by Saskatchewan Health, was installed and monitored by the station observers from mid May until the end of September.

[1] *Environment Canada 1992*
[2] *World Meteorological Organization 1988*

SUMMARIES FOR 2004

Overview

Climate Reference Station, 1997, photo credit: CR Beaulieu

Data concerning temperature, precipitation, wind speed and direction, bright sunshine, solar radiation, and soil temperature, recorded at the Saskatchewan Research Council (SRC) Climatological Reference Station (CRS) (52°09'N, 106°36'W, 497 m asl), are presented for the year 2004 and compared with the long-term (*circa* 1900-2003) and standard-period (1971-2000) records.

The first leap year of the millennium can be generally described as cool, wet and dull. It began ominously with a wave of -30°C temperatures from January 3rd to 5th. This was repeated at the end of the month when temperatures drop between -30.5°C and -40.0°C during January 26th to 29th. The extreme low temperatures combined with the wind to create average wind chills for those days between *'risk of frostbite for most people within 30 minutes of exposure'* to *'high risk for most people in two to five minutes of exposure'*. On the morning of the 28th, commuters faced a wind chill of -51. Not since 1996 had -40°C temperatures been recorded at the station. February contributed the last two -30°C temperatures for a year that had nine daily extreme temperatures of below -30°C. A brief flowering of hope for a warm spring was experienced when average temperatures for February, March and April were above normal. They were dashed when May to September's average temperatures were below or near normal; especially May and June which were well below normal. This delayed seed germination for the gardener as well as the farmer. Although Saskatoon's frost-free growing season was longer than normal with 132 days, it could not compensate for the below normal growing degree-days especially in May and June. The cool spring was followed by a summer of temperatures that were close to average. There were five days of above 30°C temperatures with an extreme of only 32.9°C occurring on July 9th. This paucity of hot temperatures were highlighted in the cooling degree-days especially in August. Correspondently, the heating degree-days were above normal for May to August. Overall, 2004 ranked 15th out of 41 for the warmest year; tied with 1993 and 2002.

Yearly precipitation was 16.2% above normal. This ranks 2004 as the 9th wettest year or 33rd driest year out of 41. Unfortunately, the rain came when least needed. Seasonal precipitation showed that winter (DJF) was the 8th driest; spring (MAM) the 7th driest and autumn (SON) the 13th driest season. Summer (JJA) was the wettest ever recorded at the station. The summer rainfall contributed almost two-thirds of the yearly total. By late September, the total yearly rainfall had surpassed the annual normal. The summer months vied for the "Most" honors. July 7th and August 28th seesawed for hourly and daily greatest precipitation honors while June, with 88.2 mm, crept between July with 95.4 mm and August with 76.4 mm for second place in the maximum monthly precipitation category. Nine daily records were set with four occurring in June. This year broke the record for the most days with precipitation with 158 days. The previous record of 147 days was set in 1969. Although we did not have forty days and forty nights of consecutive precipitation, both spring and summer did have over forty days where measurable precipitation fell. Spring 2004 had the most precipitation days ever recorded at the site while summer and autumn ranked 2nd out of 41 for their seasons.

With record precipitation days, it is not surprising bright sunshine hours were 87.8% of normal. 2004 was the 4th dullest out of 39 years of recording bright sunshine at CRS. April, September and November were the only months with normal to above normal bright sunshine. Surprisingly, the number of days with bright sunshine was just slightly above normal.

Extreme winds of over 51 km/h occurred 44 times. Spring was the windiest season. March saw seven days of extreme winds while April experienced eight days including one day of almost 80 km/h winds. May, the windiest month, endured four days of Near Gale winds (51-63 km/h) between May 2nd and May 5th. Five additional Near Gale wind days blew later in the month. The strongest annual wind occurred on February 10th with 82 km/h winds from the north-northwest resulting in blizzard conditions.

Weather Events Summaries, 2004

NEW 2004 DAILY TEMPERATURE AND PRECIPITATION RECORDS			
TYPE	DAY	NEW RECORD	OLD RECORD/ year
Maximum Daily Temperature °C	March 30	15.0	15.0/1986
	April 5	19.5	19.5/1981 & 1987
	October 9	27.8	26.0/1984
	December 3	11.0	6.7/1965
	December 19	7.5	5.0/1979 & 1981
Minimum Daily Temperature °C	June 23	2.5	3.0/1985
	July 29	4.7	5.0/1971 & 1974
	August 19	3.9	4.4/1973
Daily Precipitation mm	June 6	18.6	13.0/1984
	June 11	24.0	12.8/2002
	June 12	10.8	7.0/1999
	June 16	13.2	8.6/1995
	July 7	44.4	22.9/1969
	August 23	22.8	9.4/1971
	August 28	28.0	27.6/1992
	October 15	4.0	1.6/2003
	October 18	8.2	5.3/1979

GREATEST EXTREME PRECIPITATION EVENTS (mm)*		
PERIOD	DATE	AMOUNT
0.5 hour	August 28	17.4
0.5 hour	July 7	10.2
1 hour	August 28	19.2
1 hour	July 7	15.8
2 hours	July 7	23.0
2 hours	August 28	22.4
24 hours	July 7	44.4
24 hours	August 28	28.0

*recorded by tipping bucket April 1st to October 15th

EXTREME TEMPERATURES FOR 2004			
COLD SPELL (less than or equal to -30°)		HOT SPELL (greater than or equal to 30°C)	
DATE	TEMPERATURE °C	DATE	TEMPERATURE °C
January 3	-32.5	June 29	30.4
January 4	-31.3	July 17	32.2
January 5	-31.3	July 19	32.9
January 26	-30.5	July 25	31.2
January 27	-38.8	August 6	30.7
January 28	-41.0		
January 29	-40.0		
February 2	-32.2		
February 3	-30.1		

EXTREME WINDS FOR 2004			
DATE	WIND SPEED (km/h)	DIRECTION	BEAUFORT WIND SCALE DESIGNATION*
January 30	58.6	ESE	Near Gale
February 10	82.3	NNW	Strong Gale
February 11	51.3	NNW	Near Gale
March 6	56.9	NW	Near Gale
March 9	67.7	NW	Gale
March 10	75.4	NW	Gale
March 18	61.6	SE	Near Gale
March 19	54.7	WNW	Near Gale
March 25	55.7	NE	Near Gale
March 28	56.1	NW	Near Gale
April 15	51.8	ESE	Near Gale
April 22	60.9	NNW	Near Gale
April 23	61.7	S	Near Gale
April 24	79.7	NW	Strong Gale
April 25	55.3	NW	Near Gale
April 27	67.7	N	Gale
April 28	66.2	N	Gale
April 30	62.5	NW	Near Gale
May 2	59.1	S	Near Gale
May 3	54.3	NNW	Near Gale
May 4	51.1	N	Near Gale
May 5	51.9	N	Near Gale
May 8	59.6	WSW	Near Gale
May 9	53.8	W	Near Gale
May 13	53.0	W	Near Gale
May 19	54.8	NE	Near Gale
May 28	62.7	S	Near Gale
June 7	60.3	N	Near Gale
June 20	57.6	NW	Near Gale
July 7	52.8	ESE	Near Gale
July 12	54.4	NW	Near Gale
July 17	64.1	N	Gale
July 20	74.2	NNW	Gale
August 17	67.7	N	Gale
September 5	52.7	W	Near Gale
September 29	67.5	N	Gale
October 14	69.3	N	Gale
October 18	51.4	ESE	Near Gale
November 22	60.1	NNW	Near Gale
December 3	59.3	WNW	Near Gale
December 11	51.1	NNW	Near Gale
December 17	51.6	NW	Near Gale
December 19	75.4	WNW	Gale
December 20	68.7	N	Gale

*Near Gale >=51 but < 63
*Gale >=63 but <76
*Strong Gale >=63 but <88

Temperature Rankings

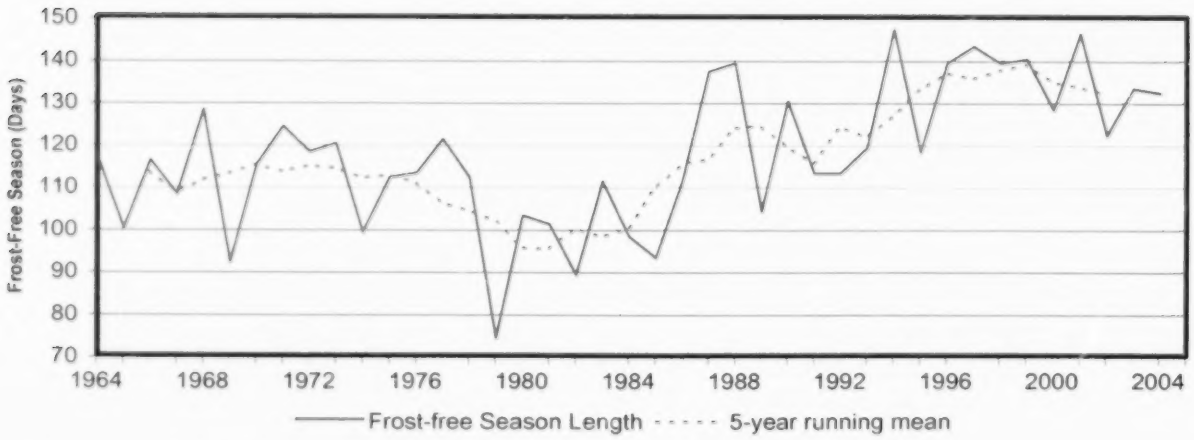
1964 - Present

WARMEST ANNUAL MAXIMUM TEMPERATURE °C		COLDEST ANNUAL MINIMUM TEMPERATURE °C		WARMEST ANNUAL AVERAGE TEMPERATURE °C		RANKING
1987	11.6	1966	-5.5	1987	5.4	1
2001	10.8	1979	-5.3	2001	4.6	2
1981	10.5	1982	-5.3	1981	4.5	3
1988	10.1	1965	-5.3	1998	4.3	4
1998	10.1	1996	-5.2	1999	4.2	5
1999	9.8	1975	-5.1	1988	3.9	6
1976	9.5	1972	-4.8	1997	3.5	7
1997	9.5	1985	-4.8	2003	3.4	8
2003	9.3	1967	-4.7	1991	3.2	9
1986	9.0	1974	-4.7	1986	3.2	10
1991	8.9	1971	-4.6	1976	3.0	11
2000	8.8	1969	-4.6	1992	3.0	12
1984	8.7	1978	-4.6	2000	3.0	13
1990	8.7	1970	-4.0	1984	2.9	14
1977	8.6	1973	-4.0	1993	2.8	15
1980	8.6	1980	-3.8	2004	2.8	16
1992	8.5	1989	-3.8	2002	2.8	17
2002	8.5	1977	-3.6	1964	2.7	18
1994	8.5	1990	-3.6	1994	2.7	19
2004	8.4	1976	-3.5	1990	2.6	20
1989	8.3	1968	-3.4	1977	2.5	21
1964	8.2	1995	-3.4	1980	2.4	22
1993	8.1	1983	-3.2	1989	2.3	23
1995	7.9	1994	-3.2	1995	2.3	24
1973	7.8	1964	-2.9	1983	2.2	25
1968	7.7	2000	-2.9	1968	2.2	26
1983	7.7	1984	-2.9	1973	1.9	27
1978	7.4	2002	-2.9	1970	1.7	28
1970	7.3	2004	-2.8	1978	1.4	29
1974	7.1	1986	-2.6	1971	1.2	30
1971	7.1	1992	-2.5	1974	1.2	31
1967	7.0	1991	-2.5	1967	1.1	32
1985	6.9	1993	-2.5	1969	1.1	33
1975	6.9	2003	-2.5	1985	1.1	34
1969	6.8	1997	-2.4	1975	0.9	35
1979	6.5	1988	-2.3	1972	0.6	36
1966	6.4	2001	-1.6	1979	0.6	37
1965	6.3	1998	-1.5	1965	0.5	38
1982	6.2	1981	-1.5	1966	0.4	39
1996	6.1	1999	-1.4	1996	0.4	40
1972	6.1	1987	0.8	1982	0.4	41

Dates and Duration of the Frost-free Season

1964 - Present

YEAR	DATE OF LAST SPRING FROST	DATE OF FIRST FALL FROST	LENGTH OF SEASON (days)
1964	May 31	Sept 26	117
1965	May 27	Sept 05	100
1966	May 19	Sept 13	116
1967	Jun 06	Sept 23	108
1968	May 19	Sept 15	128
1969	Jun 14	Sept 25	92
1970	May 19	Sept 12	124
1971	May 18	Sept 20	115
1972	May 08	Sept 04	118
1973	May 06	Sept 14	120
1974	May 25	Sept 02	99
1975	May 21	Sept 11	112
1976	May 06	Aug 28	113
1977	May 01	Aug 31	121
1978	May 30	Sept 30	112
1979	May 30	Aug 13	74
1980	May 14	Aug 26	103
1981	May 24	Sept 03	101
1982	May 29	Aug 27	89
1983	May 24	Sept 13	111
1984	May 24	Aug 31	98
1985	Jun 04	Sept 06	93
1986	May 17	Sept 06	111
1987	May 21	Oct 06	137
1988	May 02	Sept 19	139
1989	May 28	Sept 10	104
1990	May 13	Sept 21	130
1991	May 27	Sept 18	113
1992	May 23	Sept 14	113
1993	May 17	Sept 14	119
1994	May 09	Oct 04	147
1995	May 22	Sept 18	118
1996	May 12	Sept 29	139
1997	May 14	Oct 05	143
1998	May 13	Sept 30	139
1999	May 09	Sept 27	140
2000	May 17	Sept 23	128
2001	May 10	Oct 04	146
2002	May 23	Sept 23	122
2003	May 18	Sept 29	133
2004	May 20	Sept 30	132
1971-2000 Normal	May 18	Sept 14	117



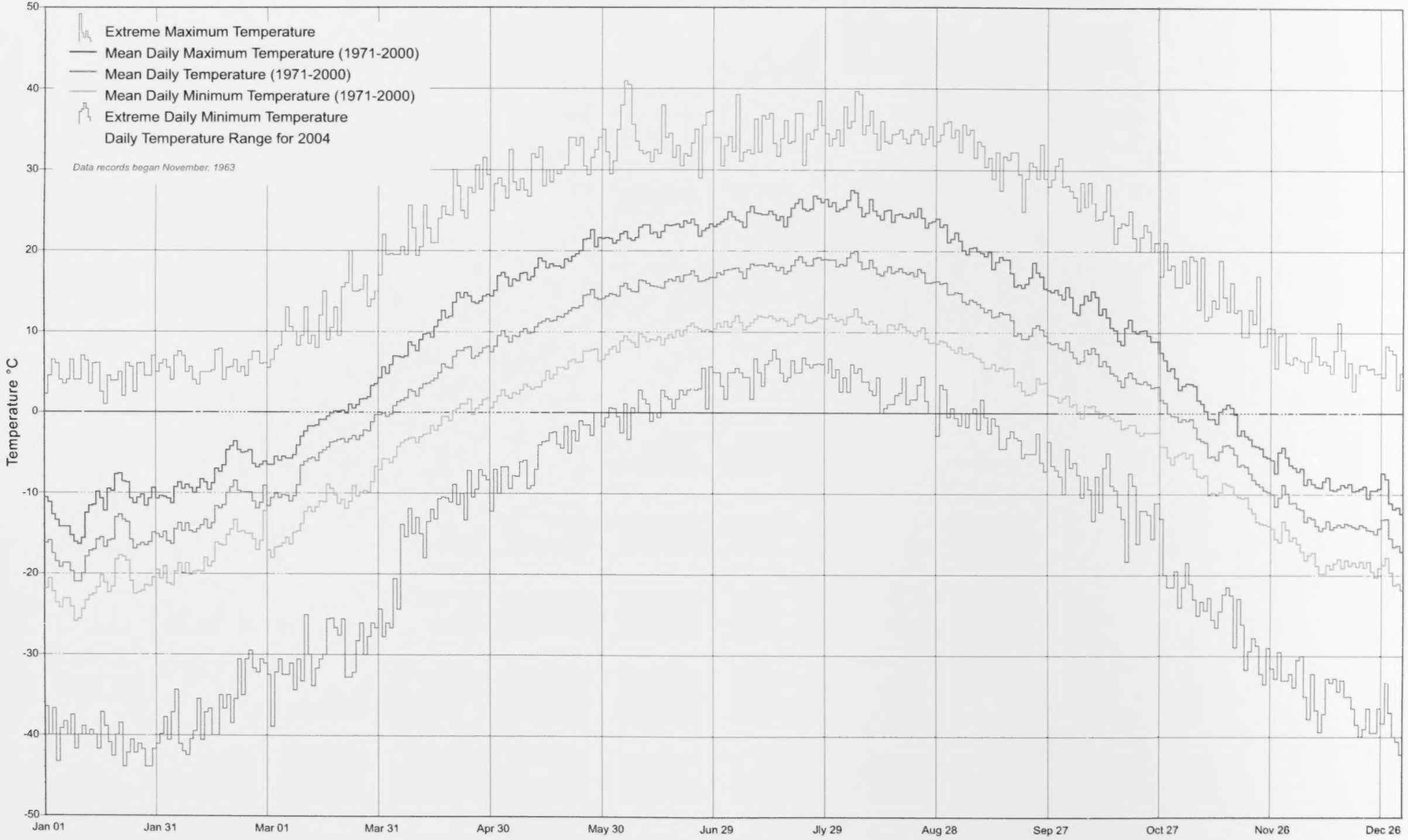
Precipitation Rankings

DRIEST MONTH BY % OF NORMAL PRECIPITATION		RANKING	DRIEST MONTH BY PRECIPITATION AMOUNT (mm)	
Nov	4.7	1	Nov	0.7
Apr	34.7	2	April	8.2
May	62.7	3	Feb	9.4
Feb	70.9	4	Dec	13.0
Dec	70.9	5	Jan	16.7
Sept	79.0	6	Mar	19.4
Jan	91.6	7	Sept	23.2
Mar	119.9	8	Oct	26.1
June	148.3	9	May	27.8
Oct	159.5	10	Aug	76.4
July	164.4	11	June	88.2
Aug	210.9	12	July	95.4

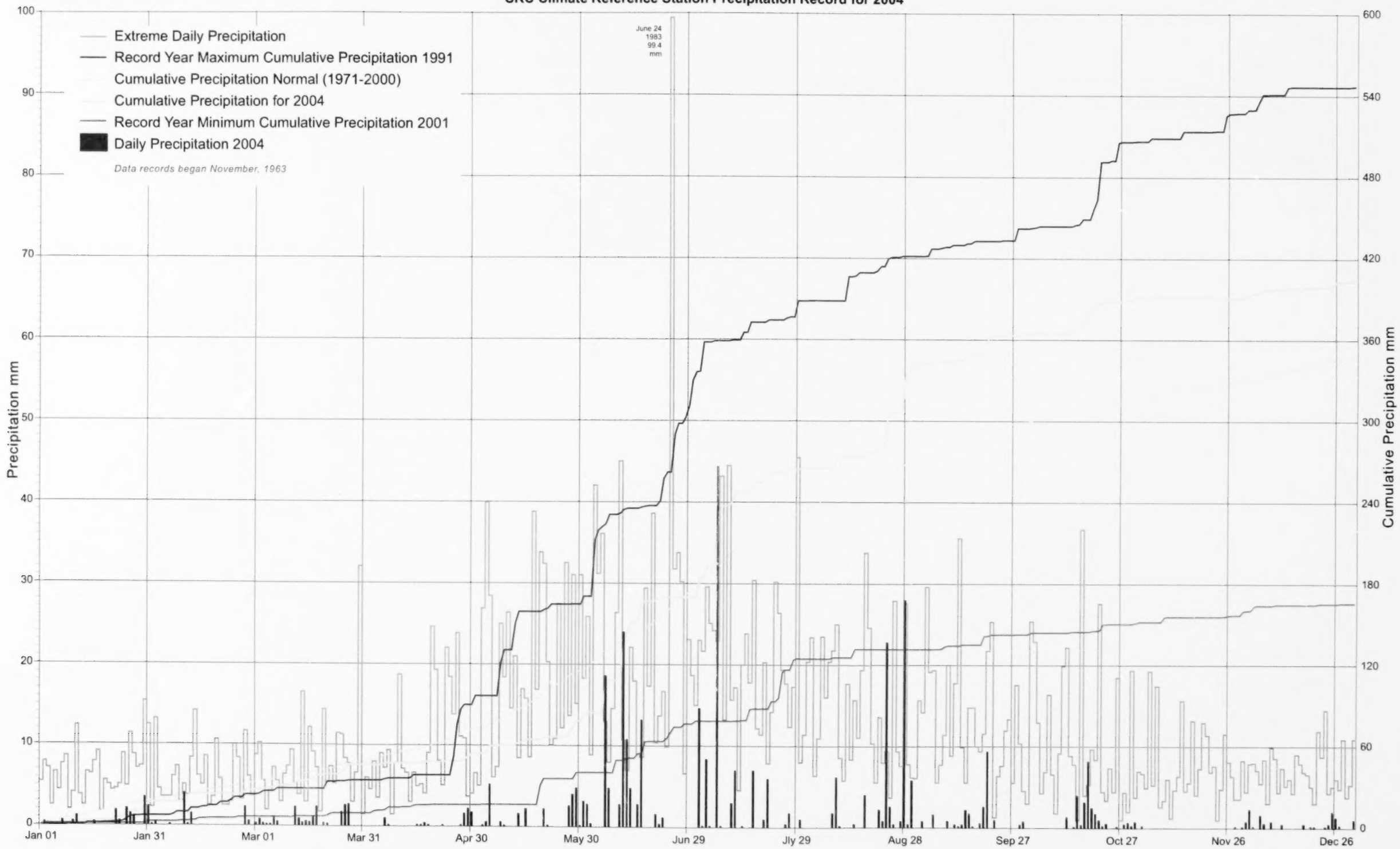
Tipping Bucket Rain Gauge, May 18, 1999
photo credit: CR Beaulieu, SRC

DRIEST YEARS (mm)		DRIEST WINTER Dec Jan Feb (mm)		DRIEST SPRING Mar Apr May (mm)		DRIEST SUMMER Jun Jly Aug (mm)		DRIEST AUTUMN Sept Oct Nov (mm)		RANKING
2001	165.8	1998	12.7	2002	20.3	1984	70.2	1999	17.2	1
1987	232.4	2002	17.3	1998	29.8	1964	73.9	1994	21.0	2
2003	257.7	1999	18.2	2001	34.0	1977	81.9	1976	21.8	3
1998	263.3	1984	22.1	1980	42.2	2001	91.2	1987	27.4	4
1981	279.8	1994	22.1	1965	43.2	1985	92.6	2001	28.5	5
1964	282.7	2001	23.7	1981	54.3	1987	105.5	2000	31.2	6
1988	285.7	2003	26.8	2004	55.4	1969	115.6	1972	32.3	7
1992	288.1	2004	32.0	1992	55.5	1992	116.4	1990	33.9	8
1997	291.4	2000	33.8	1988	55.6	1997	120.3	1971	34.2	9
1984	293.1	1964	35.0	1999	56.5	1980	124.9	1988	38.1	10
1999	297.7	1989	35.4	1984	57.2	1981	126.2	1974	40.0	11
1993	300.0	1993	35.8	1996	58.8	2003	133.3	1975	48.8	12
1980	305.9	1992	38.7	2000	59.2	1972	133.4	2004	50.0	13
1990	309.8	1996	43.0	1971	61.1	1998	135.9	1966	50.2	14
2000	315.4	1982	43.1	1966	61.2	1979	135.9	1965	20.9	15
1972	317.9	1995	43.3	2003	61.8	1967	139.9	2003	51.2	16
2002	320.0	1991	44.4	1993	62.2	1978	142.5	1995	52.6	17
1995	327.7	1997	45.0	1995	65.4	1975	144.5	1979	53.4	18
1985	330.6	1977	45.1	1770	65.7	1990	144.5	1985	55.2	19
1976	331.8	1966	45.6	1964	65.8	1988	148.9	1970	56.4	20
1996	340.6	1987	45.7	1969	68.5	1989	149.9	1981	61.4	21
1994	341.4	1990	46.3	1976	69.1	1993	151.0	1997	61.6	22
1979	352.0	1986	46.5	1972	71.6	1996	154.4	1989	64.5	23
1967	354.3	1981	50.2	1978	72.8	1973	156.1	1977	65.4	24
1978	358.1	1985	51.8	1973	73.1	1995	164.4	1992	65.9	25
1965	358.8	1975	52.0	1987	73.6	1994	165.6	1980	66.6	26
1977	370.5	1973	53.1	1967	78.0	1976	169.4	1998	70.0	27
1966	376.9	1978	54.6	1986	82.5	2000	183.8	1968	71.3	28
1989	384.8	1971	55.8	1990	87.2	1999	194.2	2002	72.8	29
1970	388.8	1968	56.0	1979	87.3	1986	196.2	1993	73.1	30
1975	392.3	1965	56.2	1997	88.2	1974	205.5	1996	74.4	31
1973	393.3	1983	57.5	1968	97.6	1965	206.6	1967	76.8	32
2004	404.5	1980	58.9	1989	101.7	2002	206.8	1964	77.4	33
1986	411.3	1988	59.3	1994	109.4	1982	208.4	1982	81.5	34
1971	414.6	1969	64.3	1982	110.8	1983	215.8	1986	87.2	35
1969	427.4	1979	71.5	1975	119.6	1970	216.5	1973	88.2	36
1982	436.2	1970	73.5	1983	125.2	1966	222.0	1983	96.2	37
1968	443.1	1967	75.1	1985	134.3	1968	225.9	1991	105.4	38
1974	462.7	1976	79.7	1991	147.3	1971	248.8	1978	111.4	39
1983	471.6	1972	82.0	1974	148.0	1991	251.6	1984	137.0	40
1991	546.9	1974	93.6	1977	164.1	2004	260.0	1969	151.8	41

SRC Climate Reference Station Temperature Record for 2004

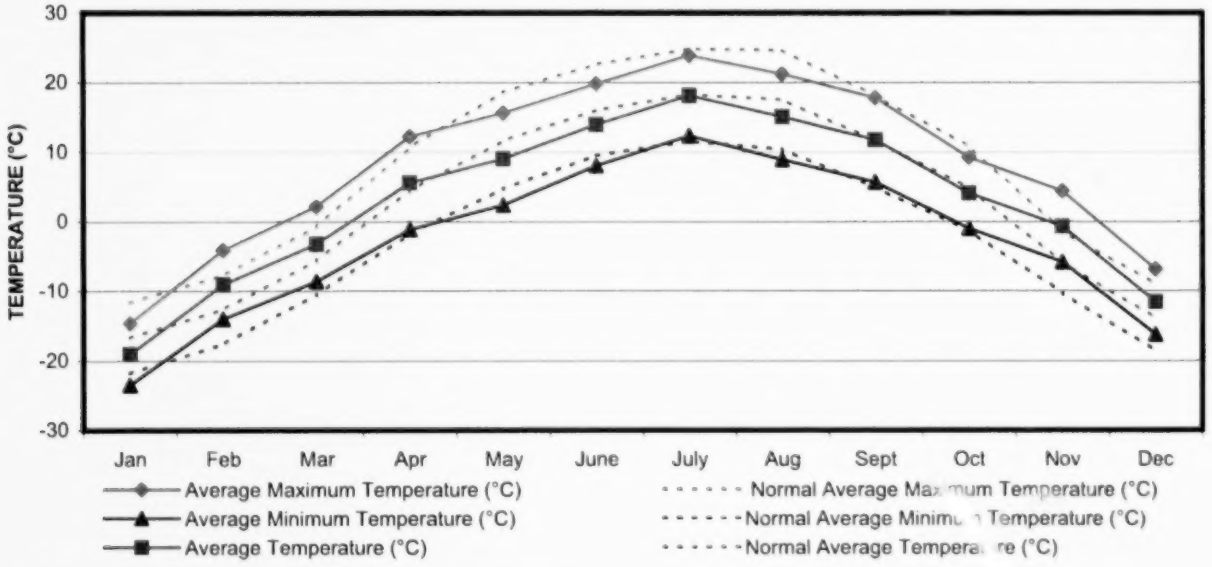


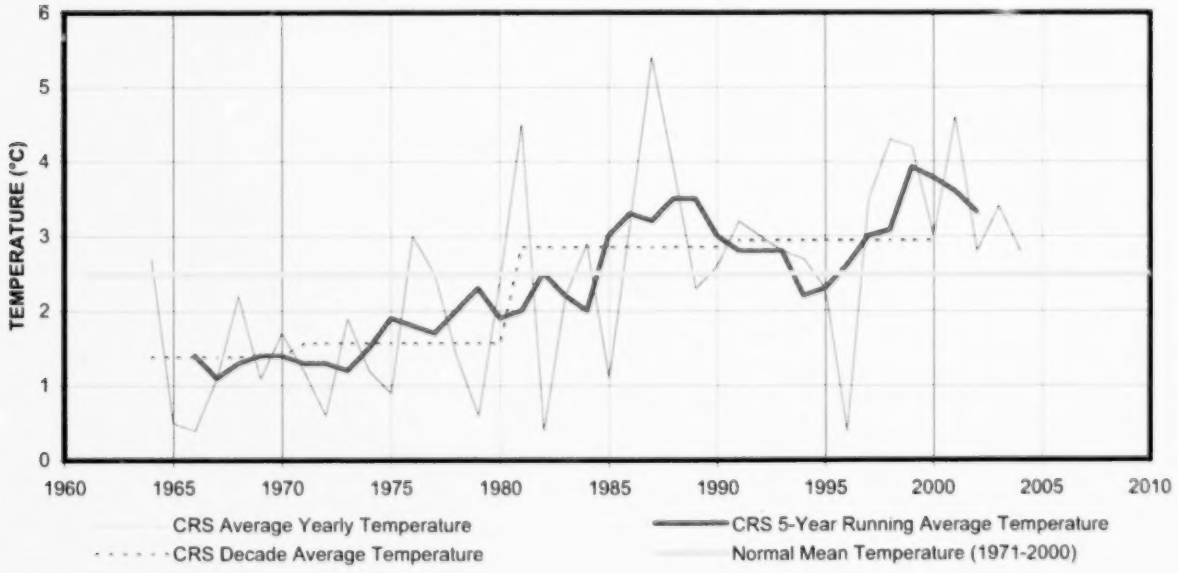
SRC Climate Reference Station Precipitation Record for 2004



Monthly Temperatures and Extreme Values for 2004 and Average Annual Temperatures for CRS (1964-2004)

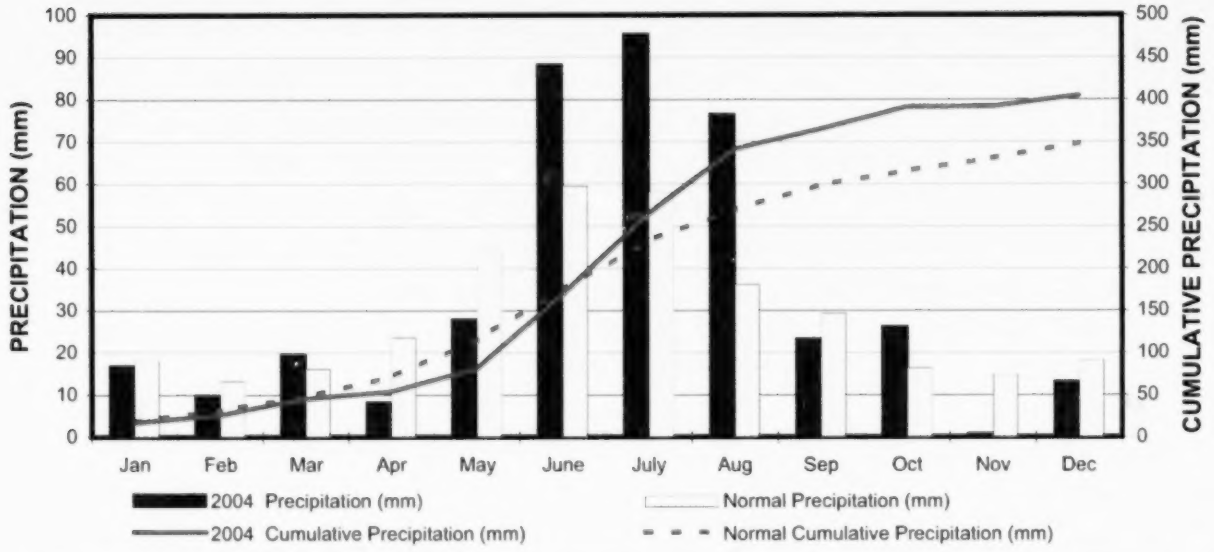
MONTH	AVERAGE MAXIMUM TEMPERATURE (°C)		AVERAGE MINIMUM TEMPERATURE (°C)		AVERAGE TEMPERATURE (°C)		EXTREME VALUES TEMPERATURE (°C)	
	2004	Normal	2004	Normal	2004	Normal	Maximum/Date	Minimum/Date
January	-14.6	-11.6	-23.5	-21.8	-19.1	-16.7	0.9/11	-41.0/28
February	-4.1	-7.7	-14.0	-17.6	-9.1	-12.6	5.0/17	-32.2/02
March	2.2	-0.7	-8.6	-10.5	-3.2	-5.6	15.0/30	-25.7/03
April	12.2	10.7	-1.1	-1.7	5.6	4.5	25.9/27	-6.7/09
May	15.6	18.6	2.4	4.7	9.0	11.6	26.6/18	-7.4/10
June	19.8	22.6	8.0	9.5	13.9	16.0	30.4/29	2.5/23
July	23.9	24.8	12.3	11.5	18.1	18.2	32.9/19	4.7/29
August	21.2	24.6	8.9	10.4	15.1	17.5	30.7/06	1.5/20
September	17.8	18.1	5.6	4.9	11.8	11.6	23.5/28	-2.5/30
October	9.2	10.8	-1.0	-1.3	4.1	4.8	27.8/09	-8.5/26
November	4.4	-1.4	-5.8	-10.3	-0.7	-5.9	14.8/15	-13.6/28
December	-6.9	-9.0	-16.2	-18.6	-11.6	-13.9	11.0/03	-29.7/23
Average	8.4	8.3	-2.8	-3.4	2.8	2.5		

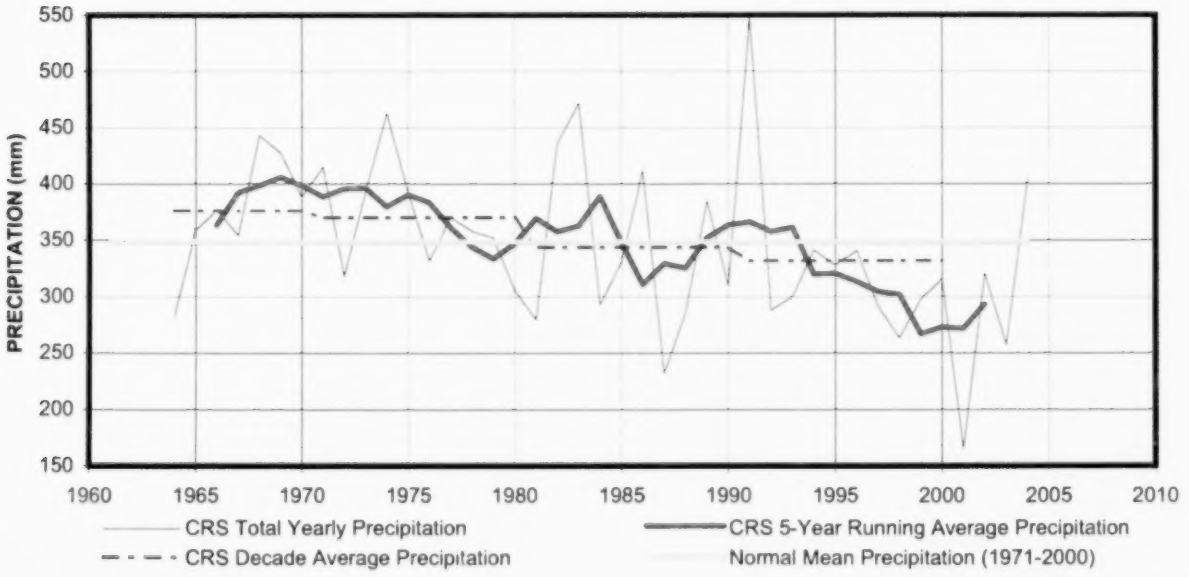




Monthly Precipitation and Extreme Values for 2004 and Total Annual Precipitation for CRS (1964-2004)

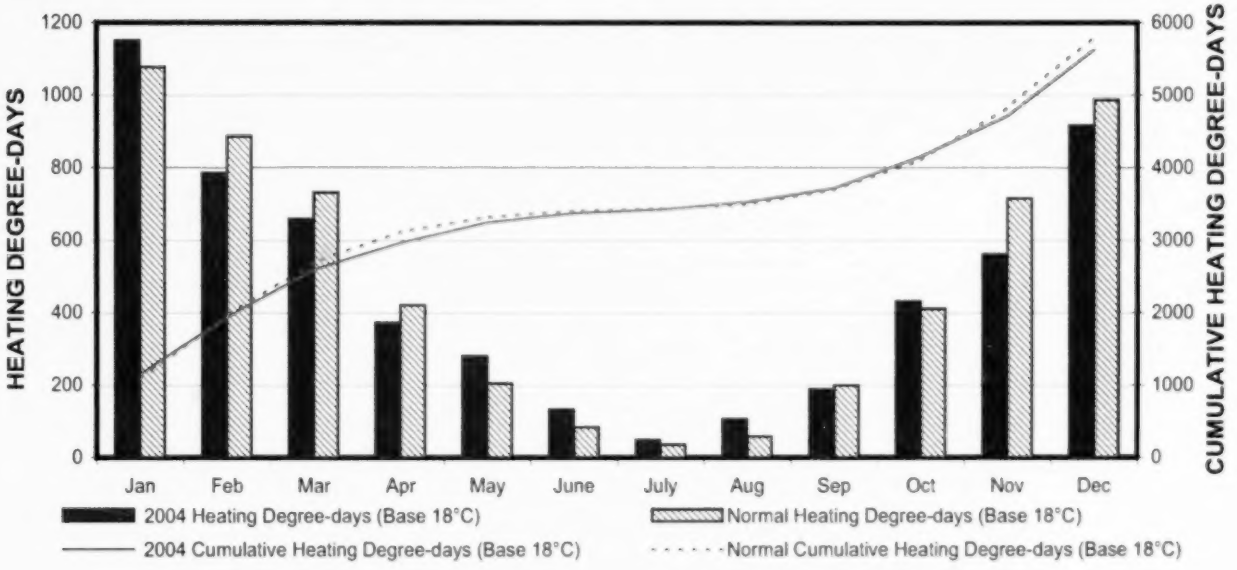
MONTH	PRECIPITATION (mm)			CUMULATIVE PRECIPITATION (mm)			EXTREME DAILY PRECIPITATION (mm)
	2004	Normal	% of Normal	2004	Normal	% of Normal	Maximum/Date
January	16.7	18.2	91.8	16.7	18.2	91.8	3.5/30
February	9.4	13.3	70.7	26.1	31.5	82.9	3.8/10
March	19.4	16.2	119.8	45.5	47.7	95.4	2.7/27
April	8.2	23.6	34.7	53.7	71.3	75.3	2.2/29
May	27.8	44.3	62.8	81.5	115.6	70.5	5.2/05
June	88.2	59.5	148.2	169.7	175.1	96.9	24.0/11
July	95.4	58.0	164.5	265.1	233.1	113.7	44.4/07
August	76.4	36.2	211.0	341.5	269.3	126.8	28.0/28
September	23.2	29.4	78.9	364.7	298.7	122.1	9.4/20
October	26.1	16.4	159.1	390.8	315.1	124.0	8.2/18
November	0.7	14.8	4.7	391.5	329.9	118.7	0.3/02
December	13.0	18.3	71.0	404.5	348.2	116.2	2.3/02
Total	404.5	348.2	116.2				

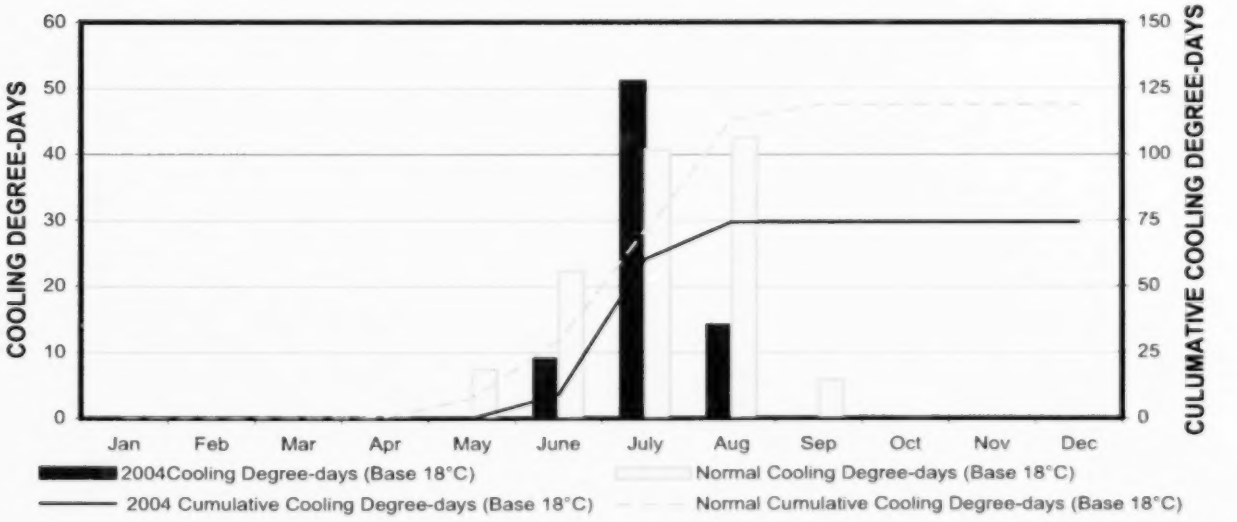




Monthly Heating and Cooling Degree-days, 2004

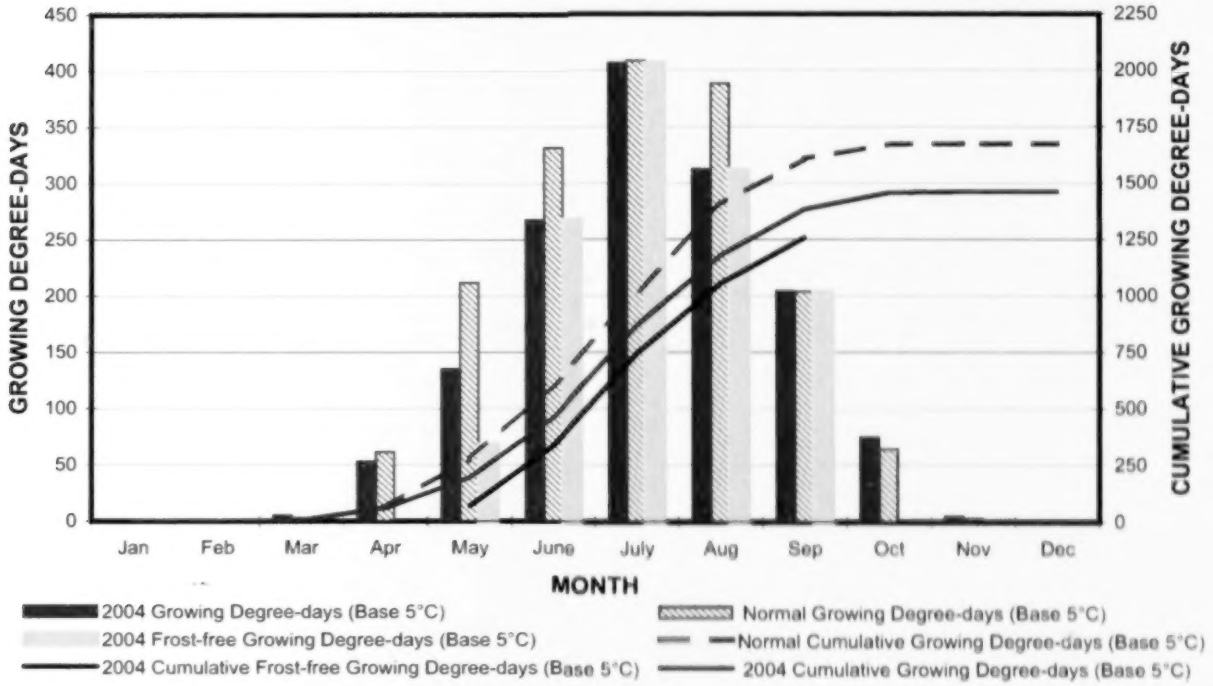
MONTH	HEATING DEGREE-DAYS Base 18°C		CUMULATIVE HEATING DEGREE-DAYS		COOLING DEGREE-DAYS Base 18°C		CUMULATIVE COOLING DEGREE-DAYS	
	2004	Normal	2004	Normal	2004	Normal	2004	Normal
January	1149.9	1076.9	1149.9	1076.9	0.0	0.0	0.0	0.0
February	785.5	886.2	1935.4	1963.1	0.0	0.0	0.0	0.0
March	658.3	732.4	2593.7	2695.5	0.0	0.0	0.0	0.0
April	372.7	420.7	2966.4	3116.2	0.0	0.3	0.0	0.3
May	278.9	204.4	3245.3	3320.6	0.0	7.4	0.0	7.7
June	131.5	82.8	3376.8	3403.4	9.0	22.3	9.0	30.0
July	48.1	35.3	3424.9	3438.7	51.1	40.7	60.1	70.7
August	105.3	57.7	3530.2	3496.4	14.1	42.5	74.2	113.2
September	187.3	198.9	3717.5	3695.3	0.0	5.8	74.2	119.0
October	431.1	410.2	4148.6	4105.5	0.0	0.1	74.2	119.1
November	561.6	715.8	4710.2	4821.3	0.0	0.0	74.2	119.1
December	917.1	987.7	5627.3	5809.0	0.0	0.0	74.2	119.1
Average	5627.3	5809.1			74.2	119.1		



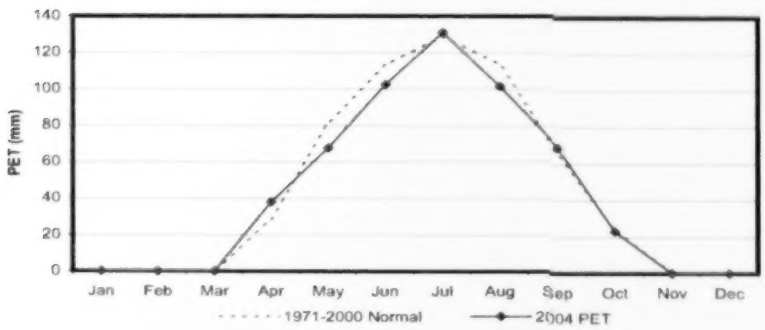


Monthly Growing Degree-days, 2004

MONTH	GROWING DEGREE-DAYS Base 5°C		CUMULATIVE GROWING DD Base 5°C		FROST-FREE GDD Base 5°C	
	2004	Normal	2004	Normal	2004	Cumulative
January	0.0	0.0	0.0	0.0	0.0	0.0
February	0.0	0.0	0.0	0.0	0.0	0.0
March	5.0	2.4	5.0	2.4	0.0	0.0
April	52.8	61.3	57.8	63.7	0.0	0.0
May	134.8	211.6	192.6	275.3	67.7	67.7
June	267.5	331.5	460.1	606.8	267.5	335.2
July	406.0	408.4	866.1	1015.2	406.0	741.2
August	311.8	387.8	1177.9	1403.0	311.8	1053.0
September	204.0	203.5	1381.9	1606.5	204.0	1257.0
October	74.6	63.7	1456.5	1670.2	0.0	1257.0
November	4.4	2.6	1460.9	1672.8	0.0	1257.0
December	0.0	0.1	1460.9	1672.9	0.0	1257.0
Total	1460.9	1672.9			1257.0	



Potential Evapotranspiration (PET) for 2004 using the Thornthwaite Method

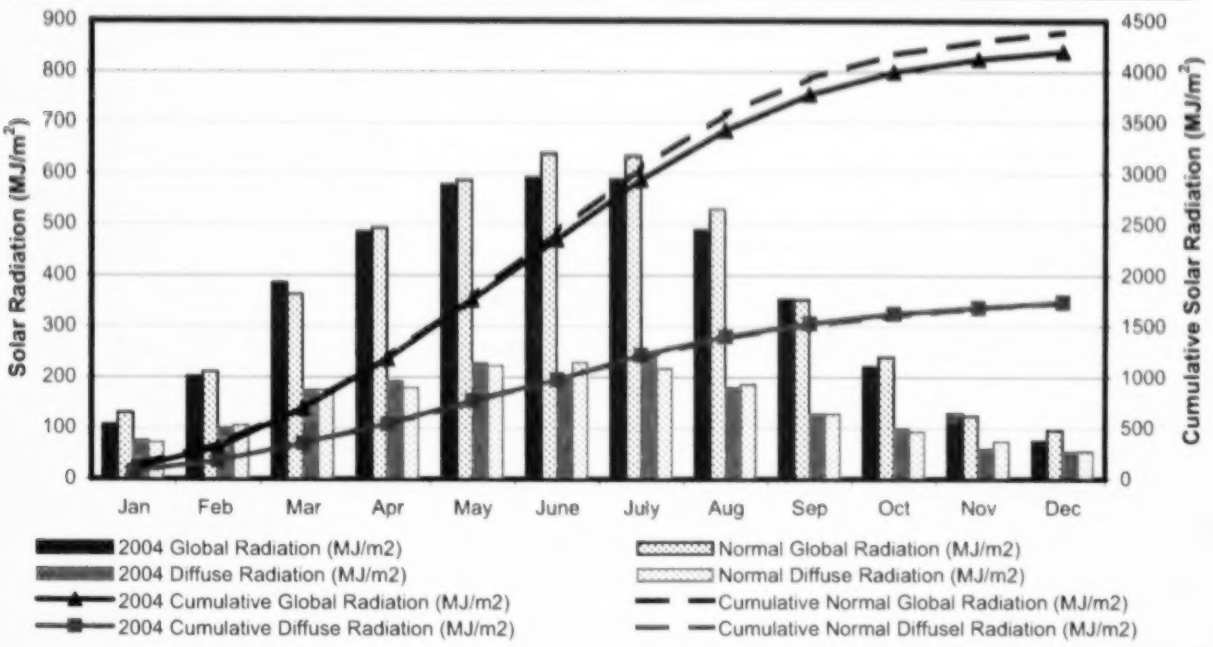


MONTH	AVERAGE TEMP °C	PET (mm)	PET 1971-2000 Normal (mm)
Jan	-19.1	0.0	0.0
Feb	-9.1	0.0	0.0
Mar	-3.2	0.0	0.0
Apr	5.6	37.9	28.6
May	9.0	67.6	81.5
June	13.9	102.4	113.2
July	18.1	130.8	128.9
Aug	15.1	101.4	113.3
Sept	11.8	68.8	64.9
Oct	4.1	23.0	24.3
Nov	-0.7	0.0	0.0
Dec	-11.6	0.0	0.0

Daily Global and Diffuse Solar Radiation, 2004
(MJ/m²)

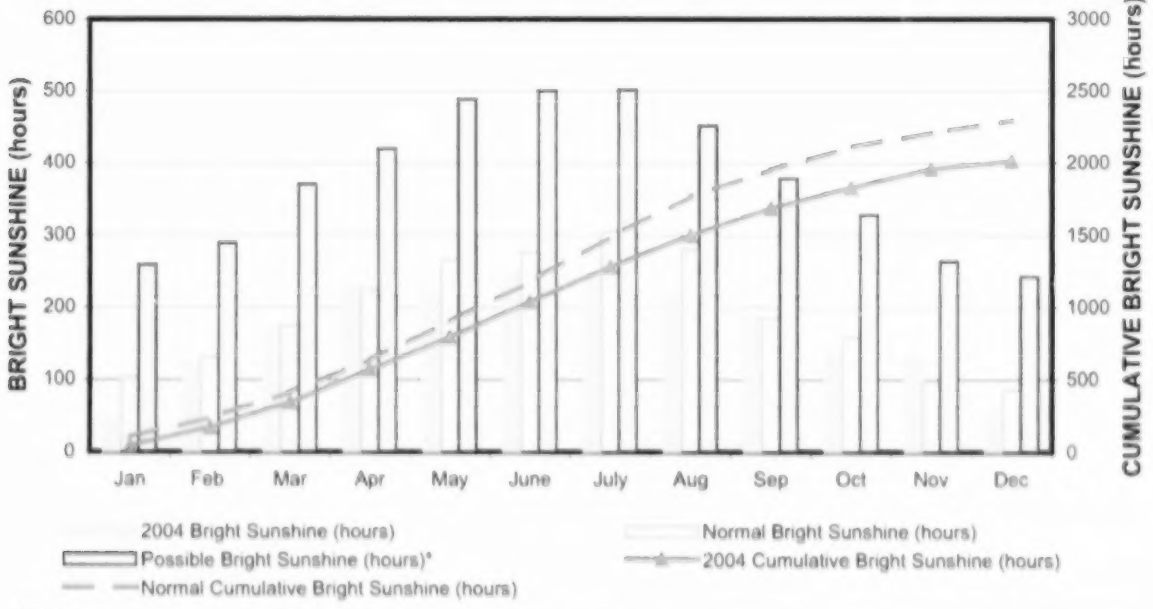
DATE	JAN		FEB		MAR		APR		MAY		JUN		JULY		AUG		SEPT		OCT		NOV		DEC	
2004	G	D	G	D	G	D	G	D	G	D	G	D	G	D	G	D	G	D	G	D	G	D	G	D
1	3.2	2.4	5.1	4.2	8.4	5.8	9.4	8.2	25.8	2.9	6.4	6.2	17.7	11.9	15.2	7.8	7.7	6.2	13.2	2.7	7.1	1.3	1.8	1.8
2	2.3	2.1	7.6	2.0	8.7	7.5	18.4	2.3	21.7	8.0	24.8	5.8	10.9	9.2	17.7	8.2	8.2	4.4	11.0	4.5	6.6	3.0	1.2	1.2
3	5.4	1.5	5.1	3.7	13.0	4.8	18.2	3.8	22.0	5.1	28.5	4.5	8.4	7.7	23.1	6.0	16.4	4.0	11.5	3.4	6.6	1.8	2.3	1.5
4	6.2	1.4	5.7	4.2	9.8	8.7	17.6	4.4	16.5	9.2	23.2	7.3	10.9	9.9	18.6	8.0	14.4	5.7	12.2	2.1	4.7	3.7	1.7	1.7
5	2.7	2.5	8.1	2.0	13.1	5.6	16.9	3.1	17.1	7.3	28.5	5.1	23.9	9.6	24.0	2.8	15.1	4.1	12.2	1.8	5.3	1.8	1.9	1.9
6	2.5	2.4	7.4	2.3	11.0	6.7	14.7	5.6	25.9	4.8	5.5	4.5	25.3	9.4	22.0	3.6	13.0	5.8	11.5	2.2	2.1	2.0	2.7	2.4
7	3.6	2.1	7.2	3.7	12.0	4.4	20.5	2.5	23.1	5.5	9.6	8.2	7.0	6.4	11.3	7.9	16.7	3.3	6.6	5.4	5.4	2.0	2.2	2.2
8	1.7	1.7	6.8	3.1	13.0	2.0	17.8	8.2	19.0	7.3	15.6	11.2	17.7	9.9	5.4	5.0	15.0	5.4	10.7	2.7	4.3	2.7	1.8	1.8
9	3.5	2.0	6.1	4.7	10.2	7.8	18.5	4.9	14.9	10.8	29.4	2.8	21.5	10.8	7.8	7.3	3.0	2.9	10.8	3.0	3.2	2.8	2.0	2.0
10	2.3	2.0	4.6	4.4	13.2	2.5	19.8	4.2	26.9	3.0	5.7	5.1	28.6	3.1	21.5	6.5	5.4	5.2	11.0	1.9	5.7	1.2	3.4	2.2
11	3.7	2.7	8.4	2.9	12.7	4.4	20.5	3.7	14.1	10.7	5.0	4.6	16.4	7.0	21.6	4.7	5.8	5.5	9.8	3.9	5.7	1.7	1.1	1.1
12	2.7	2.3	8.6	1.5	7.0	6.1	11.6	8.1	15.9	11.7	4.7	4.3	22.8	7.3	22.2	4.9	5.9	4.7	6.4	3.6	7.1	1.3	1.3	1.3
13	1.9	1.9	5.0	4.5	7.8	7.4	14.1	7.6	17.0	9.2	9.6	9.0	26.4	7.4	22.6	2.6	16.7	3.2	5.5	4.1	5.7	1.1	3.9	1.2
14	2.4	2.3	5.5	5.3	12.0	9.4	9.8	7.3	21.9	9.7	11.1	10.4	14.7	8.6	16.3	6.8	15.7	3.4	8.0	3.4	5.7	1.4	2.9	1.3
15	2.5	2.5	4.2	4.1	11.3	8.5	14.5	7.4	22.4	8.1	16.7	9.4	24.2	8.5	18.0	8.7	14.1	3.7	5.9	5.2	2.7	2.5	3.4	1.6
16	2.3	2.2	7.3	3.5	14.4	3.6	15.6	10.2	17.8	8.9	17.1	7.2	23.7	9.2	18.1	8.3	14.8	3.7	2.3	2.3	3.5	1.7	1.6	1.6
17	7.0	1.4	8.2	2.5	11.6	5.3	5.1	5.1	23.8	7.3	23.8	11.7	25.7	5.1	13.6	9.3	13.4	5.0	3.8	3.7	5.1	1.0	3.1	1.2
18	2.2	2.2	5.5	5.1	6.9	5.8	13.2	6.8	27.5	2.8	29.6	3.8	26.5	5.6	21.3	4.8	11.6	4.3	3.3	3.0	3.8	2.1	2.4	2.0
19	2.5	2.2	8.7	2.7	11.1	10.0	19.8	7.5	27.0	4.9	16.5	9.8	20.6	6.8	22.3	3.6	8.0	6.5	6.0	4.9	2.7	2.3	1.3	1.2
20	1.9	1.9	8.2	4.2	17.1	2.9	21.2	10.5	8.2	5.8	18.6	11.1	19.5	9.6	22.5	3.0	12.0	6.2	4.8	4.4	6.0	1.3	1.4	1.4
21	4.4	2.5	10.0	3.1	13.2	7.0	20.1	5.6	4.4	3.9	21.8	8.9	9.9	8.8	8.4	5.5	15.4	2.0	3.7	3.6	2.7	2.0	3.1	2.0
22	2.2	2.2	11.3	2.2	17.2	4.3	19.2	6.6	22.7	8.4	26.9	5.9	21.8	7.5	8.8	7.3	5.9	4.8	5.0	3.2	2.1	1.8	3.9	1.1
23	5.1	3.8	12.9	2.0	15.0	7.0	18.4	9.5	13.8	11.7	30.2	3.1	23.4	8.2	2.2	1.9	13.9	4.8	2.8	2.7	2.1	2.1	2.0	1.9
24	3.1	3.0	12.5	3.0	16.5	5.3	13.0	8.5	23.2	8.8	29.6	2.8	25.6	5.4	6.1	7.4	14.4	1.8	4.2	3.9	4.0	2.8	2.8	1.4
25	3.5	3.5	4.4	4.3	7.0	6.0	23.9	2.7	27.2	5.5	18.7	10.9	26.5	2.8	16.8	6.1	9.8	6.7	4.1	3.9	2.7	1.9	2.0	2.0
26	4.8	3.6	5.5	5.2	8.2	7.5	15.1	10.3	8.4	7.7	26.5	5.4	18.1	6.6	18.0	5.7	13.8	2.7	9.0	3.0	3.5	1.9	2.1	2.1
27	6.5	1.5	3.1	3.0	17.4	2.6	16.6	8.0	20.5	7.9	27.1	5.3	10.2	7.5	19.9	4.8	14.4	1.8	2.4	2.4	2.7	1.8	1.9	1.8
28	3.8	3.5	4.6	4.3	14.6	4.2	6.2	5.7	20.1	8.4	28.1	4.6	7.1	6.7	16.4	3.2	13.6	1.9	1.9	1.9	4.0	2.0	4.1	2.3
29	4.2	3.8	3.4	3.3	17.7	4.2	12.5	7.5	8.7	6.6	28.3	4.0	19.6	9.7	11.7	8.0	12.9	2.9	8.6	1.6	3.2	2.0	4.8	1.9
30	2.7	2.7			18.4	2.3	20.8	5.9	15.7	9.4	24.1	10.1	17.5	8.0	4.4	4.0	5.8	5.2	6.1	2.7	1.7	1.7	2.0	2.0
31	4.2	3.9			17.0	5.1			5.5	5.4			15.7	10.0	8.8	6.2			6.1	1.9			2.2	2.1
TOTAL	107.6	79.1	201.1	101.0	384.5	174.7	485.0	191.5	577.6	226.7	591.4	203.0	587.8	244.2	488.5	179.9	352.5	127.5	220.4	99.0	127.1	58.7	74.3	53.5
NORMALS 1961-1990	129.9	71.4	210.1	105.3	362.4	171.6	492.2	176.5	566.1	222.2	636.1	229.1	633.0	216.5	529.0	185.6	351.6	127.6	239.1	92.6	160.1	73.6	95.2	54.3

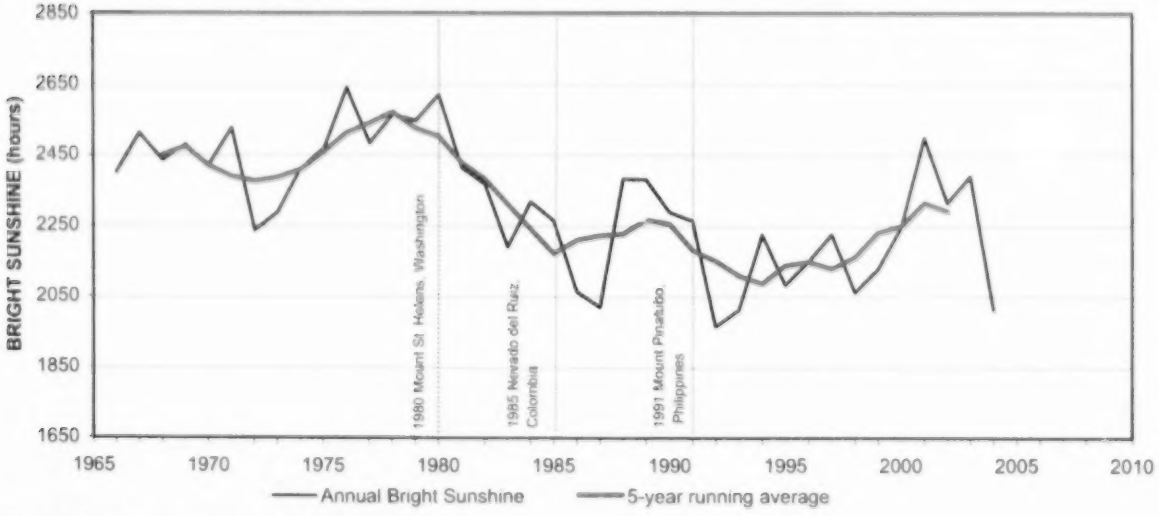
COMMENTS G= Global Radiation D= Diffuse Radiation



Bright Sunshine for 2004 and Annual Total Bright Sunshine
1966-2004

MONTH	BRIGHT SUNSHINE (hours)					CUMULATIVE BRIGHT SUNSHINE (hours)		NUMBER OF BRIGHT SUNSHINE DAYS	
	2004	Normal	% of Normal	Possible*	% of Possible	2004	% of Normal	2004	NORMAL
January	45.5	103.3	44.0	258.6	17.6	45.5	44.0	17	23.8
February	124.8	132.3	94.3	288.9	43.2	170.3	72.3	21	24.2
March	170.7	175.2	97.4	370.4	46.1	341.0	83.0	30	27.1
April	226.8	225.2	100.7	419.7	54.0	567.8	89.3	28	27.3
May	224.8	267.1	84.2	488.3	46.0	792.6	87.8	28	29.5
June	247.1	277.2	89.1	500.3	49.4	1039.7	88.1	27	28.5
July	243.1	305.7	79.5	501.3	48.5	1282.8	86.3	27	30.3
August	215.3	280.8	76.7	451.6	47.7	1498.1	84.8	27	30.1
September	188.6	186.0	101.4	378.2	49.9	1686.7	86.4	27	27.0
October	141.3	157.9	89.5	328.3	43.0	1828.0	86.6	23	27.0
November	129.5	98.0	132.1	263.3	49.2	1957.5	88.6	29	22.2
December	56.3	85.4	65.9	242.2	23.2	2013.8	87.8	17	22.8
Average	2013.8	2294.1	87.8	4490.9	44.8			301	319.9





Volcano eruption dates source: U.S. Geological Survey, n.d.

Sunrise and Sunset at Saskatoon, 2004 and 2005

(local time in hours and minutes)

2004	JANUARY		FEBRUARY		MARCH		APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER	
Date	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set
1	9:15	17:05	8:47	17:53	7:51	18:47	6:40	19:42	5:35	20:33	4:51	21:18	4:51	21:30	5:29	20:56	6:19	19:53	7:08	18:43	8:03	17:37	8:54	16:56
2	9:15	17:06	8:46	17:55	7:49	18:49	6:38	19:43	5:33	20:35	4:51	21:19	4:51	21:30	5:30	20:54	6:20	19:50	7:10	18:40	8:05	17:35	8:55	16:57
3	9:15	17:07	8:44	17:57	7:47	18:51	6:35	19:45	5:32	20:36	4:50	21:20	4:52	21:29	5:32	20:53	6:22	19:48	7:12	18:38	8:06	17:33	8:56	16:57
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15	9:09	17:24	8:23	18:20	7:19	19:12	6:08	20:06	5:11	20:56	4:45	21:29	5:04	21:20	5:51	20:30	6:42	19:20	7:32	18:11	8:28	17:14	9:09	16:55
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21	9:03	17:34	8:10	18:31	7:05	19:23	5:55	20:16	5:03	21:04	4:46	21:31	5:12	21:13	6:01	20:17	6:52	19:06	7:43	17:58	8:38	17:07	9:13	16:57
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Source: National Research Council, Canada, Hertzberg Institute of Astrophysics

Sunrise/set = corresponds to the upper limb of the sun appearing at the horizon

2005	JANUARY		FEBRUARY		MARCH		APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER	
Date	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set
1	9:15	17:06	8:46	17:55	7:52	18:47	6:40	19:41	5:36	20:32	4:52	21:18	4:50	21:30	5:28	20:56	6:18	19:53	7:08	18:43	8:02	17:37	8:53	16:58
2	9:15	17:07	8:45	17:57	7:49	18:49	6:38	19:43	5:34	20:34	4:51	21:19	4:51	21:30	5:30	20:55	6:20	19:51	7:10	18:41	8:04	17:35	8:55	16:57
3	9:15	17:08	8:43	17:58	7:47	18:50	6:36	19:45	5:32	20:36	4:50	21:20	4:52	21:29	5:31	20:53	6:22	19:49	7:11	18:39	8:06	17:34	8:56	16:57
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24	8:58	17:40	8:03	18:38	6:59	19:27	5:50	20:21	5:00	21:08	4:47	21:31	5:16	21:09	6:05	20:11	6:56	19:00	7:48	17:53	8:43	17:04	9:14	16:58
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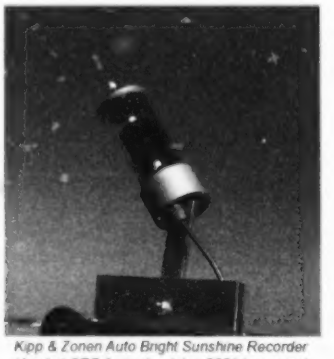
Source: National Research Council, Canada, Hertzberg Institute of Astrophysics

Sunrise/set = corresponds to the upper limb of the sun appearing at the horizon

Campbell-Stokes Bright Sunshine Recorder
Used at CRS from about Oct 1965-June 1992
photo credit: CR Beaulieu, 1993

SRC Auto Bright Sunshine Recorder
Used at CRS from about July 1992-Dec 2000
photo credit: CR Beaulieu, 1997



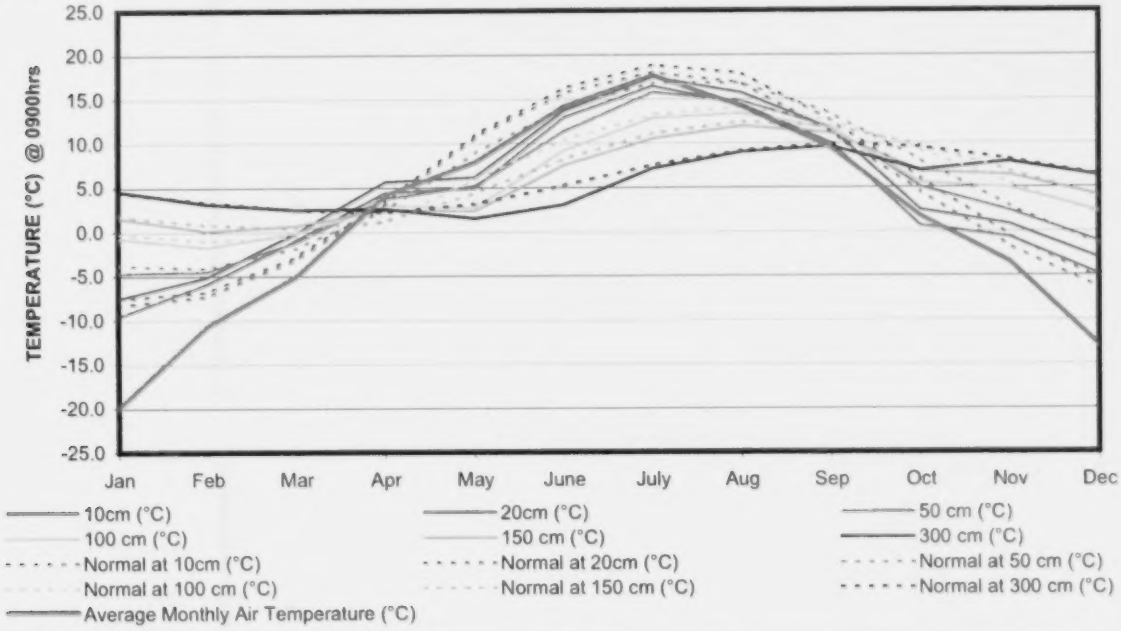
Kipp & Zonen Auto Bright Sunshine Recorder
Used at CRS from about Jan 2001 to present
photo credit: CR Beaulieu, 2000

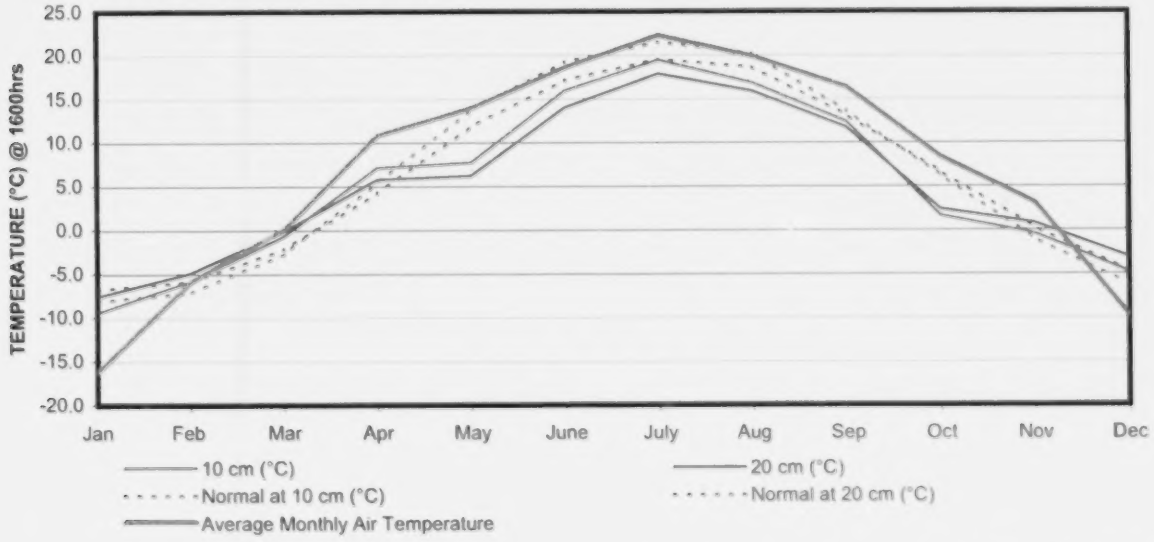
Monthly Average Soil Temperatures, 2004

(10 to 300cm depths)

MONTH	SOIL TEMPERATURES (°C) @ 0900hrs												SOIL TEMPERATURES @ 1600hrs			
	10cm		20cm		50cm		100cm		150cm		300cm		10cm		20cm	
	2004	NORM*	2004	NORM*	2004	NORM*	2004	NORM*	2004	NORM*	2004	NORM*	2004	NORM*	2004	NORM*
January	-9.6	-8.3	-7.6	-7.6	-4.7	-3.8	-0.7	-0.2	1.6	1.8	4.6	4.5	-9.5	-8.1	-7.6	-6.8
February	-5.9	-7.3	-5.1	-6.8	-4.5	-4.1	-1.7	-1.0	0.1	0.8	3.1	3.3	-5.9	-7.1	-4.9	-5.9
March	-1.0	-2.7	-0.2	-2.2	-1.2	-1.8	-0.1	-0.6	0.7	0.4	2.5	2.5	-0.7	-2.7	-0.2	-2.2
April	4.4	3.2	5.6	3.5	3.8	2.5	3.0	1.2	2.5	1.2	2.6	2.2	7.1	5.4	5.8	4.2
May	4.9	10.6	6.1	10.9	5.2	8.9	2.7	5.9	2.3	4.4	1.5	3.1	7.7	13.8	6.2	11.8
June	12.9	15.7	13.7	16.2	11.4	14.0	9.2	10.4	7.5	8.2	3.0	5.2	15.9	19.2	14.0	17.1
July	16.5	18.0	17.4	18.8	15.8	16.8	12.8	13.2	10.5	11.1	7.1	7.5	19.4	21.5	17.8	19.5
August	14.3	16.8	15.7	17.9	14.7	16.8	13.4	14.1	11.9	12.4	9.0	9.1	16.8	20.2	15.8	18.6
September	10.0	11.2	11.6	12.5	11.8	13.3	11.7	12.5	11.2	11.9	9.6	9.9	12.4	13.6	11.7	13.1
October	0.6	4.5	2.4	6.0	5.0	8.0	5.5	9.2	6.8	9.7	6.9	9.5	1.6	6.2	2.3	6.6
November	-0.7	-1.7	0.8	-0.5	2.3	2.8	4.9	5.4	6.4	6.8	7.9	8.1	-0.5	-1.1	0.7	0.2
December	-4.9	-6.5	-3.1	-5.5	-1.2	-1.6	2.2	1.9	4.1	3.9	6.2	6.3	-4.9	-6.3	-3.2	-4.8

*norm = 1961-1990

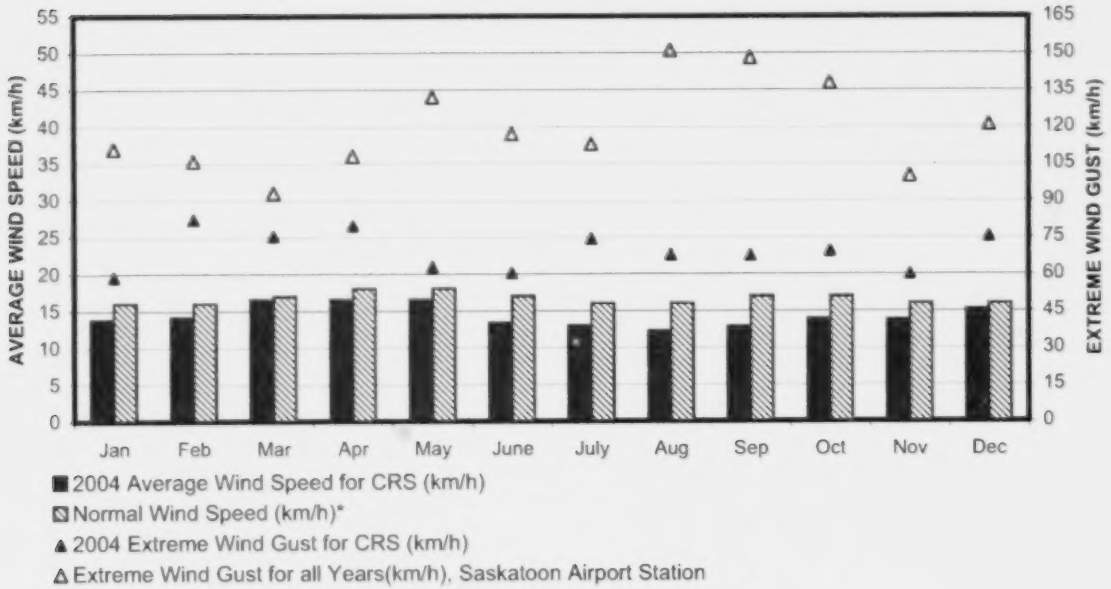




Monthly Average Wind Speed and Extreme Gusts, 2004

MONTH	AVERAGE WIND SPEED (km/h)		EXTREME GUST (km/h)		
	2004	Normal*	2004	Direction	Date
January	13.8	16.0	58.6	ESE	30
February	14.2	16.0	82.3	NNW	10
March	16.5	17.0	75.4	NW	10
April	16.5	18.0	79.7	NW	24
May	16.5	18.0	62.7	S	28
June	13.4	17.0	60.3	N	07
July	13.0	16.0	74.2	NNW	20
August	12.3	16.0	67.7	N	17
September	12.9	17.0	67.5	N	29
October	13.9	17.0	69.3	N	14
November	13.8	16.0	60.1	NNW	22
December	15.2	16.0	75.4	WNW	19

*1961-90 Normals used are from the Environment Canada, Saskatoon Airport station



Windchill Calculation Chart[1]

(revised 2001)

V \ T	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50
5	4	-2	-7	-13	-19	-24	-30	-36	-41	-47	-53	-58
10	3	-3	-9	-15	-21	-27	-33	-39	-45	-51	-57	-63
15	2	-4	-11	-17	-23	-29	-35	-41	-48	-54	-60	-66
20	1	-5	-12	-18	-24	-31	-37	-43	-49	-56	-62	-68
25	1	-6	-12	-19	-25	-32	-38	-45	-51	-57	-64	-70
30	0	-7	-13	-20	-26	-33	-39	-46	-52	-59	-66	-72
35	0	-7	-14	-20	-27	-33	-40	-47	-53	-60	-66	-73
40	-1	-7	-14	-21	-27	-34	-41	-48	-54	-61	-68	-74
45	-1	-8	-15	-21	-28	-35	-42	-48	-55	-62	-69	-75
50	-1	-8	-15	-22	-29	-35	-42	-49	-56	-63	-70	-76
55	-2	-9	-15	-22	-29	-36	-43	-50	-57	-63	-70	-77
60	-2	-9	-16	-23	-30	-37	-43	-50	-57	-64	-71	-78
65	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79
70	-2	-9	-16	-23	-30	-37	-44	-51	-59	-66	-73	-80
75	-3	-10	-17	-24	-31	-38	-45	-52	-59	-66	-73	-80
80	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81

Approximate Thresholds:

-25	Risk of frostbite in prolonged exposure
-35	Frostbite possible in 10 minutes with warm skin suddenly exposed. Shorter time if skin is cool at the start.
	Frostbite possible in less than 2 minutes with warm skin suddenly exposed. Shorter time if skin is cool at the start.

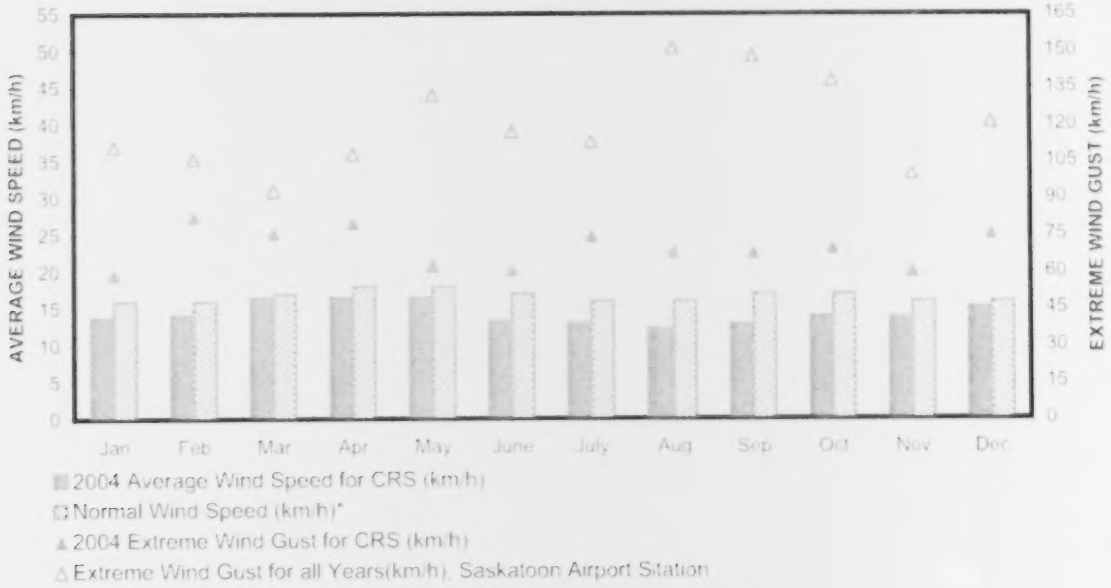
Source: Environment Canada, 2001b

where T = Air temperature (°C) and V = Observed wind speed at 10m elevation (km/h).

Monthly Average Wind Speed and Extreme Gusts, 2004

MONTH	AVERAGE WIND SPEED (km/h)		EXTREME GUST (km/h)		
	2004	Normal*	2004	Direction	Date
January	13.6	16.0	58.6	ESE	30
February	14.2	16.0	62.3	NNW	15
March	16.5	17.0	76.4	NW	10
April	16.5	18.0	79.7	NW	24
May	16.6	18.0	82.7	S	28
June	13.4	17.0	60.3	N	06
July	13.0	16.0	74.2	NNW	28
August	12.3	16.0	67.7	N	11
September	12.9	17.0	67.5	N	20
October	13.9	17.0	69.5	N	14
November	13.8	16.0	62.1	NNW	07
December	15.2	16.0	78.4	WNW	19

*Mean for Normal period from the Environment Canada Saskatoon Airport station



Windchill Calculation Chart[1]

V T	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50
5	-4	-2	-7	-13	-19	-24	-30	-36	-41	-47	-53	-58
10	-3	-3	-9	-15	-21	-27	-33	-39	-45	-51	-57	**-63**
15	-2	-4	-11	-17	-23	-29	-35	-41	-48	-54	**-60**	**-66**
20	-1	-5	-12	-18	-24	-31	-37	-43	-49	-56	**-62**	**-68**
25	-1	-6	-12	-19	-25	-32	-38	-45	-51	-57	**-64**	**-70**
30	0	-7	-13	-20	-26	-33	-39	-46	-52	-59	**-65**	**-72**
35	0	-7	-14	-20	-27	-33	-40	-47	-53	**-60**	**-66**	**-73**
40	-1	-7	-14	-21	-27	-34	-41	-48	-54	**-61**	**-68**	**-74**
45	-1	-8	-15	-21	-28	-35	-42	-48	-55	**-62**	**-69**	**-75**
50	-1	-8	-15	-22	-29	-35	-42	-49	-56	**-63**	**-70**	**-76**
55	-2	-9	-15	-22	-29	-36	-43	-50	-57	**-63**	**-70**	**-77**
60	-2	-9	-16	-23	-30	-37	-43	-50	-57	**-64**	**-71**	**-78**
65	-2	-9	-16	-23	-30	-37	-44	-51	-58	**-65**	**-72**	**-79**
70	-2	-9	-16	-23	-30	-37	-44	-51	-59	**-66**	**-73**	**-80**
75	-3	-10	-17	-24	-31	-38	-45	-52	-59	**-66**	**-73**	**-80**
80	-3	-10	-17	-24	-31	-38	-45	-52	**-60**	**-67**	**-74**	**-81**

Approximate Thresholds:

-25	Risk of frostbite in prolonged exposure
-35	Frostbite possible in 10 minutes with warm skin suddenly exposed. Shorter time if skin is cool at the start.
-60	Frostbite possible in less than 2 minutes with warm skin suddenly exposed. Shorter time if skin is cool at the start.

where T = Air temperature (°C) and V = Observed wind speed at 10m elevation (km/h)

smart science solutions

Saskatchewan Research Council

Annual Weather Summary

latitude 52°09'N Longitude 106°36'W asl 497 m Saskatoon

CRS estab 1963

		2004 VALUE	2003 VALUE	NORMAL (1971-2000) OR EXTREME (1892-2003)
TEMPERATURE	Average annual maximum (°C)	8.4	9.3	8.3
	Extreme annual maximum (°C/date)	32.9/July 19	38.9 August 16	41.5 June 06, 1988
	Average annual minimum (°C)	-2.8	-2.5	-3.4
	Extreme annual minimum (°C/date)	-41.0/Jan 28	-33.9 March 07	-50.0 Feb 01 1893
	Annual **average** (°C)	2.8	3.4	2.5
	No. of Frost-free days (Temperature ≤ 0°C)	163	187	197.1
DEGREE-DAYS	Annual growing (5°C base)	1460.9	2019.5	1672.9
	Annual frost-free growing (5°C base)	1257.0	1691.0	1691.0
	Annual heating (18°C base)	5627.3	5527.2	5808.8
	Annual cooling (18°C base)	74.2	257.4	119.1
PRECIPITATION	Annual total (mm)	404.5	257.7	348.2
	Greatest 24-hr (mm/date)	44.4 July 07	28.4 July 06	99.4 June 24,1983
	Greatest Monthly (mm/date)	95.4 July	58.8 July	186.8 June 1942
	Measurable precipitation days (≥ 0.2mm)	158	110	115.7
WIND	Average monthly speed (km/h)	13.0	14.9	16.6*
	Peak gust (speed/direction/date)	82.3 NNW Feb 10	87.8 WNW May 16	151.0 W Aug 14, 1967*
RADIATION	Total annual bright sunshine (hours)	2013.8	2389.8	2294.1
	% possible bright sunshine	44.8	53.3	51.2
	% normal bright sunshine	87.8	104.2	
	Bright Sunshine days	301	322	319.9
	% of normal Bright Sunshine days	94.1	100.7	
	Total annual global radiation(MJ/m²)	4198.4	4585.2	4391.9**
	Total annual diffuse radiation (MJ/m²)	1736.1	1770.5	1729.6**

For Your Information

Normal and Extreme Values

The 1971-2000 normals for CRS have been calculated from original data entered on computerized spreadsheets and checked for correctness. Where suitable, missing data has been replaced with data from the University of Saskatchewan, Kernen Farm station (2.5 km E of CRS) and the Meteorological Service of Canada Airport station (10 km WNW of CRS). Wind normals marked with '*' are from the MSC airport station. Global and Diffuse radiation normals marked by '**' are from 1961-1990 period.

Extreme values are from the Saskatoon area weather stations extending back to 1882. The earlier records from 1882 to 1901 have several large gaps.

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Monthly Weather Summary

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latitude 52°09'N Longitude 106°36'W asl 497 m Saskatoon

CRS estab. 1963

January 2004		2004 VALUE	2003 VALUE	NORMAL OR EXTREME FOR CRS 1971-2000	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly **maximum** (°C)	-14.6	-10.3	-11.6	
	Extreme monthly maximum (°C/date)	0.9/11	5.4/08	7.0/1986/11&1993/30	10.0/1931/30 SWT
	Average monthly **minimum** (°C)	-23.5	-20.3	-21.8	
	Extreme monthly minimum (°C/date)	-41.0/28	-31.6/26	-43.9/1966/22&1969/28&29	-48.9/1893/31 SM
	Monthly **average** (°C)	-19.1	-15.3	-16.7	
	No. of Frost-free days (Temp. > 0°C)	0	0	0	
DEGREE-DAYS	Monthly growing (5°C base)	0.0	0.0	0.0	
	Yearly total-to-date growing	0.0	0.0	0.0	
	Monthly heating (18°C base)	1149.9	1033.1	1076.9	
	Yearly total-to-date heating	1149.9	1033.1	1076.9	
	Monthly cooling (18°C base)	0.0	0.0	0.0	
	Yearly total-to-date cooling	0.0	0.0	0.0	
PRECIPITATION	Monthly total (mm)	16.7	7.2	18.2	66.1/1911 SE
	Yearly total-to-date (mm)	16.7	7.2	18.2	
	Greatest 24-hr (mm/date)	3.5/30	2.1/26	15.4/1989/30	30.5/1893/23 SM
	Measurable precipitation days (≥ 0.2mm)	14	10	11.3	
WIND	Average monthly speed (km/h)	13.8	12.5	16.0 SA	
	Peak gust (speed/direction/date)	58.6 ESE 30	65.5 WNW 08		111.0 W 1986/11 SA
RADIATION	Monthly bright sunshine (hours)	45.5	124.9	103.3	
	% possible bright sunshine	17.6	48.2	40.0	
	% normal bright sunshine	44.0	120.9		
	Bright Sunshine days	17	26	23.8	
	Monthly global radiation(MJ/m²)	107.0	133.7	129.9	
	Monthly diffuse radiation (MJ/m²)	75.7	66.6	71.4	
SOIL	Average temperature (°C) @ 9:00am — grass level	-17.4	-10.2		
	10 cm/20 cm	-9.6/-7.6	-7.2/-5.8	-8.3/-7.6	
	50 cm/100cm	-4.7/-0.7	-3.6/-0.1	-3.8/-0.2	
	150 cm/300cm	1.6/4.6	1.8/4.5	1.8/4.5	

Saskatoon Stations
SM=interrupted readings (NWMP) about 1892-1900
SE= Eby (pioneer) 1901-41
SA= S'toon Airport 1942-
SWT= S'toon Water Treatment Plant 1974-

Normals
Global and diffuse radiation = 1961-1990
Soil Temperatures = 1961-1990
Wind Normal and Extreme are from Saskatoon Airport

For Your Information

'Winter weather' were the words widely whispered behind winter wraps this January. Not since 1996 have we had January temperatures in the -40°C range. This January we experienced seven days of temperatues of at least -30°C or colder along with two occurrences of below -40°C temperatures. The heating degree-days were 73 more than normal. Precipitation was minimal until the end of the month when blizzard conditions produced 5.9 cm of snow to add to the 10.8 cm accumulated during the month. With 14 days recording snow fall, 20 days recorded less than one hour of bright sunshine. The bright sunshine hours were less than half their normal value.

Saskatchewan pioneers normally took advantage of cold winter weather to cut a supply of ice from lakes for summer refrigeration. Three by nine foot blocks of ice were cut with a hand ice saw and pulled out by a team of sharp-shod horses. After being cut into three, they were stored in ice houses insulated with sawdust or put down ice wells to provide a means of keeping milk, cream and meat fresh during the summer. Ice houses and wells were used until the 1950's when rural electrification occured.[1]

[1]Semans and District Historical Society, 1982.

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Monthly Weather Summary

latitude 52°09'N Longitude 106°36'W asl 497 m Saskatoon

CRS estab. 1963

	February 2004	2004 VALUE	2003 VALUE	NORMAL OR EXTREME FOR CRS 1971-2000	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly **maximum** (°C)	-4.1	-10.1	-7.7	
	Extreme monthly maximum (°C/date)	5.0/17	-1.5/07	7.9/2002/17	12.8/1931/19$_{SE}$
	Average monthly **minimum** (°C)	-14.0	-20.2	-17.6	
	Extreme monthly minimum (°C/date)	-32.2/02	-33.5/24	-41.1/1972/06	-50.0/1893/01$_{SM}$
	Monthly **average** (°C)	-9.1	-15.2	-12.6	
	No. of Frost-free days (Temp. > 0°C)	0	0	0.2	
DEGREE-DAYS	Monthly growing (5°C base)	0.0	0.0	0.0	
	Yearly total-to-date growing	0.0	0.0	0.0	
	Monthly heating (18°C base)	785.5	928.7	886.2	
	Yearly total-to-date heating	1935.4	1961.8	1963.1	
	Monthly cooling (18°C base)	0.0	0.0	0.0	
	Yearly total-to-date cooling	0.0	0.0	0.0	
PRECIPITATION	Monthly total (mm)	9.4	8.1	13.3	43.7/1924$_{SE}$
	Yearly total-to-date (mm)	26.1	15.3	31.5	
	Greatest 24-hr (mm/date)	3.8/10	4.1/17	14.2/1979/13	30.0/1962/03$_{SA}$
	Measurable precipitation days (≥ 0.2mm)	8	12	8.9	
WIND	Average monthly speed (km/h)	14.2	13.3	16.0	
	Peak gust (speed/direction/date)	82.3^{NNW}10	57.7^{N}11		106.0^{N}1988/22$_{SA}$
RADIATION	Monthly bright sunshine (hours)	124.8	110.0	132.3	
	% possible bright sunshine	43.2	39.5	47.4	
	% normal bright sunshine	94.3	83.1		
	Bright Sunshine days	21	19	24.2	
	Monthly global radiation(MJ/m^2)	201.1	202.1	210.1	
	Monthly diffuse radiation (MJ/m^2)	101.0	107.6	105.3	
SOIL	Average temperature (°C) @ 9:00am — grass level	-6.7	-7.5		
	10 cm/20 cm	-5.9/-5.1	-7.3/-6.1	-7.3/-6.8	
	50 cm/100cm	-4.5/-1.7	-4.7/-1.7	-4.1/-1.0	
	150 cm/300cm	0.1/3.1	0.2/3.1	0.8/3.3	

Normals
Global and diffuse radiation = 1961-1990
Soil Temperatures = 1961-1990
Wind Normal and Extreme are from Saskatoon Airport

Saskatoon Stations
SM=interrupted readings (NWMP) about 1892-1900
SE= Eby (pioneer) 1901-41
SA= S'toon Airport 1942-Present

For Your Information

On February 2nd, noon, the groundhog stepped forth from his burrow, saw his shadow and promptly dove back down it thinking winter was here to stay for at least six more weeks. This was understandable considering the minimum temperatures for the first three days of February hovered near -30°C. By the 4th, however, daytime temperatures, with the exception of the 11th and 14th , rose above -10°C and remained there for the rest of the month. The latter two-thirds of the month experienced ten days of above 0°C temperatures peaking to 5.0°C on the 17th. With such unseasonable warm temperatures, the monthly averages were 3.6°C above normal. Blizzard conditions on the 10th produced the month's heaviest daily snow accumulation. The monthly total, 9.4mm, was 3.9mm less than normal increasing the yearly deficit to 82.9% of normal. It was not a particular sunny month with 7.5 hours less than normal bright sunshine. Ten days recorded less than 1 hour of sunshine with the last five days of the month recording no bright sunshine.

This year is the 11th leap year celebrated at the Climate Reference Station. During that time, the coldest temperature on February 29th was -31.1°C/1980 while the warmest was 6.1°C/1968. The most precipitation experienced on a leap day was 3.7mm/2000. Other than this year, only February 29, 1984, recorded no bright sunshine.

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Saskatchewan Research Council

Monthly Weather Summary

latitude 52°09'N Longitude 106°36'W asl 497 m Saskatoon

CRS estab. 1963

March 2004		2004 VALUE	2003 VALUE	NORMAL OR EXTREME FOR CRS 1971-2000	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly **maximum** (°C)	2.2	-2.8	-0.7	
	Extreme monthly maximum (°C/date)	15.0/30	12.9/30	20.0/1993/23	22.8/1910/23$_{SE}$
	Average monthly **minimum** (°C)	-8.6	-13.3	-10.5	
	Extreme monthly minimum (°C/date)	-25.7/03	-33.9/07	-38.9/1972/02	-43.3/1897/14$_{SM}$
	Monthly **average** (°C)	-3.2	-8.0	-5.6	
	No. of Frost-free days (Temp. > 0°C)	2	2	1.2	
DEGREE-DAYS	Monthly growing (5°C base)	5.0	1.6	2.4	
	Yearly total-to-date growing	5.0	1.6	2.4	
	Monthly heating (18°C base)	658.3	807.0	732.4	
	Yearly total-to-date heating	2593.7	2768.8	2695.5	
	Monthly cooling (18°C base)	0.0	0.0	0.0	
	Yearly total-to-date cooling	0.0	0.0	0.0	
PRECIPITATION	Monthly total (mm)	19.4	4.8	16.2	59.0/1927$_{SE}$
	Yearly total-to-date (mm)	45.5	20.1	47.7	
	Greatest 24-hr (mm/date)	2.7/27	1.5/23	32.0/1967/30	32.0/1967/30
	Measurable precipitation days (≥ 0.2mm)	19	9	9.0	
WIND	Average monthly speed (km/h)	16.5	13.8	17.0	
	Peak gust (speed/direction/date)	75.4^{NW}10	73.3^{W}23		93.0^{W}1959/18
RADIATION	Monthly bright sunshine (hours)	170.7	209.0	175.2	
	% possible bright sunshine	46.1	56.7	47.3	
	% normal bright sunshine	97.4	119.3		
	Bright Sunshine days	30	29	27.1	
	Monthly global radiation(MJ/m^2)	384.5	412.8	362.4	
	Monthly diffuse radiation (MJ/m^2)	174.7	182.3	173.9	
SOIL	Average temperature (°C) @ 9:00am — grass level	-1.7	-4.8		
	10 cm/20 cm	-1.0/-0.2	-5.1/-6.1	-2.7/-2.2	
	50 cm/100cm	-1.2/-0.1	-4.0/-1.9	-1.8/-0.6	
	150 cm/300cm	0.7/2.5	-0.4/2.0	0.4/2.5	

Saskatoon Stations
SM=interrupted readings (NWMP) about 1892-1900
SE= Eby (pioneer) 1901-41

Normals
Global and diffuse radiation = 1961-1990
Soil Temperatures = 1961-1990
Wind Normal and Extreme are from Saskatoon Airport

For Your Information

"In like a lion and out like a lamb" perfectly described March 2004. For the first six days winter parkas were needed because the temperatures were between -0.5° and -25.7°C . After that, spring sprung with 21 out of the remaining 25 days recording above zero temperatures. On the 30th, a temperature of 15°C tied the 1986 daily temperature record. The average temperature was 2.4°C above normal with the maximum temperature contributing the lion's share with 2.9°C above normal. These unusually high temperatures were reflected in the lower heating degree-days and the above average soil temperatures. Precipitation, 3.2 mm above normal, fell as rain, sleet and snow. On the 26th, glaze was experienced. The geese and gophers were evident by the 8th and robins had returned by the 31st.

Spring was and can still be a dangerous time for those who live near rivers. In 1928, the South Saskatchewan River near Pike Lake forced several families to escape to safety when an ice dam formed across the river. The whole valley (approx. 8 km wide) was flooded, drowning hundreds of farm animals and wildlife. [1]Phillips, 2003.

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Saskatchewan Research Council

Monthly Weather Summary

latitude 52°09'N Longitude 106°36'W asl 497 m Saskatoon

CRS estab. 1963

April 2004

		2004 VALUE	2003 VALUE	NORMAL OR EXTREME FOR CRS 1971-2000	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly **maximum** (°C)	12.2	10.8	10.7	
	Extreme monthly maximum (°C/date)	25.9/27	23.7/22	31.5/2001/28	33.3/1952/28$_{SA\ US}$
	Average monthly **minimum** (°C)	-1.1	0.6	-1.7	
	Extreme monthly minimum (°C/date)	-6.7/09	-10.9/04	-27.8/1979/01	-30.5/1979/01$_{SWT}$
	Monthly **average** (°C)	5.6	5.7	4.5	
	No. of Frost-free days (Temp. > 0°C)	8	18	10.6	
DEGREE-DAYS	Monthly growing (5°C base)	52.8	104.8	61.3	
	Yearly total-to-date growing	57.8	106.4	63.7	
	Monthly heating (18°C base)	372.7	368.0	420.7	
	Yearly total-to-date heating	2966.4	3136.8	3116.2	
	Monthly cooling (18°C base)	0.0	0.0	0.3	
	Yearly total-to-date cooling	0.0	0.0	0.3	
PRECIPITATION	Monthly total (mm)	8.2	43.6	23.6	86.1/1955$_{US}$
	Yearly total-to-date (mm)	53.7	63.7	71.3	
	Greatest 24-hr (mm/date)	2.2/29	14.7/26	24.6/1985/19	30.2/1955/19$_{US}$
	Measurable precipitation days (≥ 0.2mm)	11	17	8.4	
WIND	Average monthly speed (km/h)	16.5	17.4	18.0	
	Peak gust (speed/direction/date)	79.7^{NW}24	77.6^{WNW}09		108.0^{W}1959/06
RADIATION	Monthly bright sunshine (hours)	226.8	180.5	225.2	
	% possible bright sunshine	54.0	43.2	53.7	
	% normal bright sunshine	100.7	80.2		
	Bright Sunshine days	28	19	27.3	
	Monthly global radiation(MJ/m^2)	485.0	447.2	492.2	
	Monthly diffuse radiation (MJ/m^2)	191.9	182.1	178.5	
SOIL	Average temperature (°C) @ 9:00am — grass level	8.9	8.7		
	10 cm/20 cm	4.4/5.6	4.3/0.3	3.2/3.5	
	50 cm/100cm	3.8/3.0	2.7/1.5	2.5/1.2	
	150 cm/300cm	2.5/2.6	1.0/1.8	1.2/2.2	

Saskatoon Stations
SA= S'toon Airport 1942-
US= Univ. of SK 1915-64
SWT= S'toon Water Treatment Plant 1974-

Normals
Global and diffuse radiation = 1961-1990
Soil Temperatures = 1961-1990
Wind Normal and Extreme are from Saskatoon Airport

For Your Information

No matter how much you like winter, April's arrival heralding spring is always a much anticipated event. However, while April's monthly average temperature was above normal, there were fewer frost-free days than normal. Precipitation was a scarce commodity but did occur on eleven days; three days more than normal. Bright sunshine was near normal with only three days experiencing less than one hour of sunshine. The most notable weather element was the wind. Although the average wind speed for April was below normal, Saskatonians endured eight days of winds over 50 km/h. The strongest wind blew from the NW at 79.7 km/h (Strong Gale) on the 24th. 'Gale' winds (63-75 km/h) occurred twice, while 'Near Gale' winds (51-62 km/h) happened five times.

Winds are part of the prairie spring but when they blow long and hard across unprotected prairie soil, 'Black Blizzards' result. 'Black Sunday' in April 1935, was one of the most memorable dust storms of the Dirty Thirties. Ships' crews far out into the Atlantic swept decks that had been covered in prairie dust. In some cases, soil piled up in prairie attics collapsed the ceilings. Prairie housekeepers hung wet sheets over doors and windows in a futile attempt to keep the dust out.[1] [1]Phillips 2003

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Monthly Weather Summary

latitude 52°09'N Longitude 106°36'W asl 497 m Saskatoon

CRS estab. 1963

May 2004		2004 VALUE	2003 VALUE	NORMAL OR EXTREME FOR CRS 1971-2000	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly **maximum** (°C)	15.6	20.2	18.6	
	Extreme monthly maximum (°C/date)	26.6/18	28.5/25	35.0/1988/30	37.2/1936/27$_{SE}$
	Average monthly **minimum** (°C)	2.4	5.7	4.7	
	Extreme monthly minimum (°C/date)	-7.4/10	-2.0/11	-10.0/1967/02	-12.8/1907/06$_{SE}$
	Monthly **average** (°C)	9.0	13.0	11.6	
	No. of Frost-free days (Temp. > 0°C)	20	27	25.6	
DEGREE-DAYS	Monthly growing (5°C base)	134.8	248.1	211.6	
	Yearly total-to-date growing	192.6	354.5	275.3	
	Monthly heating (18°C base)	278.9	166.2	204.4	
	Yearly total-to-date heating	3245.3	3303.0	3320.6	
	Monthly cooling (18°C base)	0.0	10.2	7.4	
	Yearly total-to-date cooling	0.0	10.2	7.7	
PRECIPITATION	Monthly total (mm)	27.8	13.4	44.3	178.0/1977$_{SWT}$
	Yearly total-to-date (mm)	81.5	77.1	115.6	
	Greatest 24-hr (mm/date)	5.2/05	6.4/16	39.9/1985/04	59.0/1999/18$_{SA}$
	Measurable precipitation days (≥ 0.2mm)	14	4	9.8	
WIND	Average monthly speed (km/h)	16.5	17.1	18.0	
	Peak gust (speed/direction/date)	62.7^{S}28	87.8^{WNW}16		132.0^{SW}1965/17$_{SA}$
RADIATION	Monthly bright sunshine (hours)	224.8	289.0	267.1	
	% possible bright sunshine	46.0	59.3	54.7	
	% normal bright sunshine	84.2	108.2		
	Bright Sunshine days	28	31	29.5	
	Monthly global radiation(MJ/m²)	577.6	671.8	586.3	
	Monthly diffuse radiation (MJ/m²)	226.7	237.8	222.2	
SOIL	Average grass level	13.4	20.8		
	temperature (°C) 10 cm/20 cm	4.9/6.1	11.1/9.9	10.6/10.9	
	@ 9:00am 50 cm/100cm	5.2/2.7	9.3/7.0	8.9/5.9	
	150 cm/300cm	2.3/1.7	5.2/3.3	4.4/3.1	

Saskatoon Stations
SE= Eby (pioneer) 1901-41
SA= S'toon Airport 1942-
SWT= S'toon Water Treatment Plant 1974-

Normals
Global and diffuse radiation = 1961-1990
Soil Temperatures = 1961-1990
Wind Normal and Extreme are from Saskatoon Airport

For Your Information

May was a tad chilly. The average maximum temperature was the sixth coldest recorded at our station while the average minimum temperature was the third coldest. The average monthly temperature, 2.6°C below normal, placed this May as the fifth coldest May on record. May's growing degree-days were 36.3% below normal while the heating degree-days were 36.4% above. The last spring frost (we hope) occurred on May 20th. Because of the below normal air temperatures, the soil temperatures are warming very slowly at all levels with the upper levels affected the most. Precipitation, 16.5mm less than normal, was concentrated in the last five days of the month when over half the monthly total fell. The yearly precipitation deficit rose from last month's 24.7% to 29.5% less than normal. Along with being cold, May was also windy. Winds of 51 to 62 km/h occurred nine times throughout the month.

Saskatchewan is not unfamiliar with strong winds. In 1996, a Pilot Butte area farmer had his three cows knocked off their feet and blown across the farmyard. The winds picked up the farmer and dumped him 130m away. He survived but was "as black as the Ace of Spades."[1]

[1]Phillips 2003

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Monthly Weather Summary

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latitude 52°09'N Longitude 106°36'W asl 497 m Saskatoon

CRS estab 1963

	June 2004	2004 VALUE	2003 VALUE	NORMAL OR EXTREME FOR CRS 1971-2000	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly **maximum** (°C)	19.8	23.3	22.6	
	Extreme monthly maximum (°C/date)	30.4/29	35.5/19	41.0/1988/05	41.5/1988/06$_{S2}$
	Average monthly **minimum** (°C)	8.0	10.2	9.5	
	Extreme monthly minimum (°C/date)	2.5/23	4.0/10&24	-3.3/1967/06	-3.9/1917/02$_{US}$
	Monthly **average** (°C)	13.9	16.7	16.0	
	No. of Frost-free days (Temp. > 0°C)	30	30	29.9	
DEGREE-DAYS	Monthly growing (5°C base)	267.5	352.3	331.5	
	Yearly total-to-date growing	460.1	706.8	606.8	
	Monthly heating (18°C base)	131.5	67.1	82.8	
	Yearly total-to-date heating	3376.8	3370.1	3403.4	
	Monthly cooling (18°C base)	9.0	29.4	22.3	
	Yearly total-to-date cooling	9.0	39.6	30.0	
PRECIPITATION	Monthly total (mm)	88.2	31.4	59.5	186.8/1942$_{S}$
	Yearly total-to-date (mm)	169.7	108.5	175.1	
	Greatest 24-hr (mm/date)	24.0/11	16.4/02	99.4/1983/24	99.4/1983/24$_{SRC}$
	Measurable precipitation days (≥ 0.2mm)	13	10	12.5	
WIND	Average monthly speed (km/h)	13.4	15.6	17.0	
	Peak gust (speed/direction/date)	60.3^{N}07	82.8^{WNW}27		117.0^{S}1986/01$_{SA}$
RADIATION	Monthly bright sunshine (hours)	247.1	240.7	277.2	
	% possible bright sunshine	49.4	48.1	55.4	
	% normal bright sunshine	89.1	86.8		
	Bright Sunshine days	27	30	28.5	
	Monthly global radiation(MJ/m^2)	591.4	626.1	638.7	
	Monthly diffuse radiation (MJ/m^2)	203.0	254.3	228.1	
SOIL	Average temperature (°C) @ 9:00am — grass level	20.1	21.5		
	10 cm/20 cm	12.9/13.7	15.6/15.0	15.7/16.2	
	50 cm/100cm	11.4/9.2	13.2/10.7	14.0/10.4	
	150 cm/300cm	7.5/3.0	8.6/5.5	8.2/5.2	

Saskatoon Stations
SA= S'toon Airport 1942-
US= Univ. of SK 1915-64
SRC= SK Res. Council 1963-
S= Saskatoon 1941-42
S2=Saskatoon 2 1977-90

Normals
Global and diffuse radiation = 1961-1990
Soil Temperatures = 1961-1990
Wind Normal and Extreme are from Saskatoon Airport

For Your Information

It is a good thing the beginning of summer is marked on the calendar. This year, temperatures were not a great indicator. June was cold, but not record cold, at 2.1°C below normal. That dubious honour belongs to June 1985 when the average was 12.9°C. This June's average maximum temperature, along with 1966 and 1993, are tied for second place for the lowest average monthly maximum temperature recorded at the site. One daily minimum record temperature was set on the 23rd. Gardeners were of two minds; cursing the cold weather but celebrating the generous rainfalls. Precipitation was 48.2% above normal. Record daily rainfalls occurred on the 6th, 11th, 12th, and 16th. With the abundant rainfall, the yearly precipitation level rose to near normal by the month's end. With 13 days of rain, it is not unexpected that the bright sunshine total is 10.9% less than normal.

The greatest one day rainfall for Saskatoon occurred on June 24, 1983. The rain, falling in three episodes, totalled 99.4 mm. At my Aunt's home, water was inches from the basement walls when I arrived. Tying my pants up above my knees, I grabbed a rake and waded close to where the storm drain was situated. Once the drain was cleared of debris, the water receded from my aunt's home. I ended up being soaked to the skin but her basement remained dry unlike many in Saskatoon that day.

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Monthly Weather Summary

latitude 52°09'N Longitude 106°36'W asl 497 m Saskatoon

CRS estab 1963

July 2004		2004 VALUE	2003 VALUE	NORMAL OR EXTREME FOR CRS 1971-2000	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly **maximum** (°C)	23.9	26.7	24.8	
	Extreme monthly maximum (°C/date)	32.9/19	35.2/17	39.3/ 2001/05	40.0/1919/17&1941/19&1946/
	Average monthly **minimum** (°C)	12.3	12.9	11.5	$30_{SE,BE,UE,SA}$
	Extreme monthly minimum (°C/date)	4.7/29	8.6/03	1.7/1967/02&1978/09	$-0.6/1918/25_{SE}$
	Monthly **average** (°C)	18.1	19.8	18.2	
	No. of Frost-free days (Temp. > 0°C)	31	31	31	
DEGREE-DAYS	Monthly growing (5°C base)	406.0	459.5	408.4	
	Yearly total-to-date growing	866.1	1166.3	1015.2	
	Monthly heating (18°C base)	48.1	16.8	35.3	
	Yearly total-to-date heating	3424.9	3386.9	3438.7	
	Monthly cooling (18°C base)	51.1	73.3	40.7	
	Yearly total-to-date cooling	60.1	112.9	70.7	
PRECIPITATION	Monthly total (mm)	95.4	58.8	58.0	$162.9/1928_{SE}$
	Yearly total-to-date (mm)	265.1	167.3	233.1	
	Greatest 24-hr (mm/date)	44.4/07	28.4/06	45.5/1968/29	$79.2/1946/03_{US}$
	Measurable precipitation days (≥ 0.2mm)	15	8	12.0	
WIND	Average monthly speed (km/h)	13.0	13.2	16.0	
	Peak gust (speed/direction/date)	$74.2^{NNW}20$	$78.5^{W}13$		$113.0^{E}1955/05_{SA}$
RADIATION	Monthly bright sunshine (hours)	243.1	321.0	305.7	
	% possible bright sunshine	48.5	63.9	61.0	
	% normal bright sunshine	79.5	105.0		
	Bright Sunshine days	27	30	30.3	
	Monthly global radiation(MJ/m²)	587.8	679.7	633.5	
	Monthly diffuse radiation (MJ/m²)	244.2	210.4[1]	216.5	
SOIL	Average temperature (°C) @ 9:00am — grass level	23.0	24.4		
	10 cm/20 cm	16.5/17.4	18.8/19.2	18.0/18.8	
	50 cm/100cm	15.8/12.8	16.4/13.1	16.8/13.2	
	150 cm/300cm	10.5/7.1	10.9/7.5	11.1/7.5	

Saskatoon Stations

SE= Eby (pioneer) 1901-41
SA= S'toon Airport 1942-
US= Univ of SK 1915-64

Normals

Global and diffuse radiation = 1961-1990
Soil Temperatures = 1961-1990
Wind Normal and Extreme are from Saskatoon Airport

For Your Information

Although it didn't feel like it, July's temperatures, were very close to normal. That being said, the site did register a daily record low temperature on the 29th when 4.7°C was measured. This edged out the old CRS records, set in 1971 & 1974, of 5.0°C. What was not normal about July was the rain. After so many years of drought conditions, the 37.4mm above normal precipitation was a bit of a novelty. The 95.4mm of rain placed this July as the fourth wettest since 1964 after 1971 (125.9mm), 1986 (115.8mm) and 1968 (100.4mm). A daily precipitation record was set on the 7th with 44.4mm washing out the old record of 22.9mm set in 1969. The greatest daily maximum precipitation, set on July 29th, 1968 with 45.5mm, still stands. At least five thunderstorms were observed; two were accompanied by pea-size and golf ball-size hail.

July is no stranger to severe weather. In 1992, a Saskatoon mother had just finished explaining storms to her two small boys, assuring them there was nothing to be afraid of, when lightning struck less than a metre from where they stood. Splinters from the door frame cut one boy's legs and lightning blew off the doorbell. Said the mother, "They are never going to believe me now."[1]

[1]Phillips, 2003

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Saskatchewan Research Council

Monthly Weather Summary

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latitude 52°09'N Longitude 106°36'W asl 497 m Saskatoon

CRS estab. 1963

August 2004		2004 VALUE	2003 VALUE	NORMAL OR EXTREME FOR CRS 1971-2000	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly **maximum** (°C)	21.2	28.9	24.6	
	Extreme monthly maximum (°C/date)	30.7/06	38.9/16	39.7/1998/06	39.7/1998/06$_{SRC}$
	Average monthly **minimum** (°C)	8.9	14.3	10.4	
	Extreme monthly minimum (°C/date)	1.5/20	7.1/26	-2.8/1976/28	-16.1/1977/16$_{S2}$
	Monthly **average** (°C)	15.1	21.6	17.5	
	No. of Frost-free days (Temp. > 0°C)	31	31	30.8	
DEGREE-DAYS	Monthly growing (5°C base)	311.8	516.0	387.8	
	Yearly total-to-date growing	1177.9	1682.3	1403.0	
	Monthly heating (18°C base)	105.3	13.2	57.7	
	Yearly total-to-date heating	3530.2	3400.1	3496.4	
	Monthly cooling (18°C base)	14.1	126.2	42.5	
	Yearly total-to-date cooling	74.2	239.1	113.2	
PRECIPITATION	Monthly total (mm)	76.4	36.0	36.2	178.9/1954$_{NRC}$
	Yearly total-to-date (mm)	341.5	203.3	269.3	
	Greatest 24-hr (mm/date)	28.0/28	22.4/08	33.8/1998/17	84.3/1945/03$_{SA}$
	Measurable precipitation days (≥ 0.2mm)	14	8	9.8	
WIND	Average monthly speed (km/h)	12.3	14.3	16.0	
	Peak gust (speed/direction/date)	67.7^{N}17	64.8^{WNW}08		151.0^{W}1967/14$_{SA}$
RADIATION	Monthly bright sunshine (hours)	215.3	274.2	280.8	
	% possible bright sunshine	47.7	60.5	62.2	
	% normal bright sunshine	76.7	97.6		
	Bright Sunshine days	27	29	30.1	
	Monthly global radiation(MJ/m^2)	488.8	548.4	529.0	
	Monthly diffuse radiation (MJ/m^2)	179.9	182.8	185.6	
SOIL	Average temperature (°C) @ 9:00am — grass level	20.1	23.4		
	10 cm/20 cm	14.3/15.7	19.6/20.2	16.8/17.9	
	50 cm/100cm	14.7/13.4	18.0/15.2	16.8/14.1	
	150 cm/300cm	11.9/9.0	13.0/9.4	12.4/9.1	

Saskatoon Stations
SA= S'toon Airport 1942-
NRC= Nat. Res. Council 1952-66
SRC= SK Res. Council 1963-
S2=Saskatoon 2 1977-90

Normals
Global and diffuse radiation = 1961-1990
Soil Temperatures = 1961-1990
Wind Normal and Extreme are from Saskatoon Airport

For Your Information

It may have not rained for forty days and nights and it may not have rained enough to float an ark but it did feel like it with 14 days of meaurable rainfall. August received over twice the normal amount of rain due to two episodes of weather. On the 23rd /24th, 25.4mm of rain was recorded while on the 28th, 28.0mm of rain fell accompanied by pea to marble-sized hail. Within one half hour, 17.4mm was recorded. The 23rd and 28th rainfalls set new daily records. These two episodes accounted for about 70% of the monthly total. This August was the fourth wettest recorded at CRS. The month was cool with an average temperature 2.4°C below normal. On the 20th, while frost was reported at other Saskatoon climate stations, CRS managed to escape with a minimum temperature of 1.5°C. The low monthly temperatures are reflected in the degree-days. Bright sunshine, at 215.3 hours, was considerably less than the normal 280.8 hours. All in all, August was a wet, cold dreary month.

Hail, known as 'The Great White Combine' can destroy a bumper crop in a matter of minutes. It can also reek devastation on wildlife and people. Such was the case in 1912 when hundreds of ducks and pelicans were battered to death by hailstones in the McDonald Hills area east of Last Mountain Lake. While sheltering in their home, one woman was rendered unconscious and her 10 children were badly bruised by the hailstones that destroyed the roof of their house.[1]

[1]Philips 2003.

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Monthly Weather Summary

latitude 52°09'N Longitude 106°36'W asl 497 m Saskatoon

CRS estab. 1963

	September 2004	2004 VALUE	2003 VALUE	NORMAL OR EXTREME FOR CRS 1971-2000	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly **maximum** (°C)	17.8	18.2	18.1	
	Extreme monthly maximum (°C/date)	23.5/28	33.6/04	35.6/1978/04	35.6/1978/04$_{SRC}$
	Average monthly **minimum** (°C)	5.6	6.1	4.9	
	Extreme monthly minimum (°C/date)	-2.5/30	-4.3/30	-7.8/1974/30	-11.1/1908/28$_{SE}$
	Monthly **average** (°C)	11.8	12.2	11.6	
	No. of Frost-free days (Temp. > 0°C)	29	28	25.6	
DEGREE-DAYS	Monthly growing (5°C base)	204.0	217.1	203.5	
	Yearly total-to-date growing	1381.9	1899.4	1606.5	
	Monthly heating (18°C base)	187.3	192.7	198.9	
	Yearly total-to-date heating	3717.5	3592.8	3695.3	
	Monthly cooling (18°C base)	0.0	18.3	5.8	
	Yearly total-to-date cooling	74.2	257.4	119.0	
PRECIPITATION	Monthly total (mm)	23.2	35.8	29.4	111.7/1921$_{US}$
	Yearly total-to-date (mm)	364.7	239.1	298.7	
	Greatest 24-hr (mm/date)	9.4/20	27.4/09	35.6/1993/12	44.2/1931/12$_{US}$
	Measurable precipitation days (≥ 0.2mm)	15	9	8.4	
WIND	Average monthly speed (km/h)	12.9	15.4	17.0	
	Peak gust (speed/direction/date)	67.5^{N}30	67.7^{SE}10&^{WNW}23		148^{W}1967/22$_{SA}$
RADIATION	Monthly bright sunshine (hours)	188.6	182.7	186.0	
	% possible bright sunshine	49.9	48.1	49.2	
	% normal bright sunshine	101.4	98.2		
	Bright Sunshine days	27	29	27.0	
	Monthly global radiation(MJ/m^2)	352.8	358.8	351.8	
	Monthly diffuse radiation (MJ/m^2)	127.8	150.1	127.6	
SOIL	Average temperature (°C) @ 9:00am — grass level	12.8	12.5		
	10 cm/20 cm	10.0/11.6	11.4/12.7	11.2/12.5	
	50 cm/100cm	11.8/11.7	13.3/13.2	13.3/12.5	
	150 cm/300cm	11.2/9.6	12.5/10.5	11.9/9.9	

Saskatoon Stations
SE= Eby (pioneer) 1901-41
SA= S'toon Airport 1942-
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SRC= SK Res. Council 1963-

Normals
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Soil Temperatures = 1961-1990
Wind Normal and Extreme are from Saskatoon Airport

For Your Information

September, with the colourful fall foliage, warm, sunny afternoons and crisp cool nights, was idyllic for outside activities. Temperatures were very close to of normal and frost was not reported at the station until the last day of the month. The frost-free season lasted for 132 days as the last spring frost occurred on May 20th. This is 15 days longer than the normal of 117 days but 15 days fewer than the record of 147 days experienced in 1994. Bright sunshine hours and days were as expected for September. Precipitation, 79% of normal, occurred on almost twice as many days as normal. The first fall frost, on the 30th, was followed by flakes of snow falling from the firmament and gale force winds.

Walt Whitman, the great 19th century American poet, could have been describing this autumn when he wrote: "It is only here in large portions of Canada that wondrous *second wind*, the Indian summer, attains its amplitude and heavenly perfection, - the temperatures, the sunny haze; the mellow, rich, delicate, almost *flavoured* air: Enough to live - enough to merely be."[1]

[1]Brown 2003

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Monthly Weather Summary

latitude 52°09'N Longitude 106°36'W asl 497 m Saskatoon

CRS estab. 1963

	October 2004	2004 VALUE	2003 VALUE	NORMAL OR EXTREME FOR CRS 1971-2000	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly **maximum** (°C)	9.2	13.7	10.8	
	Extreme monthly maximum (°C/date)	27.8/09	26.0/05	28.5/1980/06&1984/08	32.2/1943/05$_{SAUS}$
	Average monthly **minimum** (°C)	-1.0	1.0	-1.3	
	Extreme monthly minimum (°C/date)	-8.5/26	-11.7/31	-21.5/1984/30,31&1991/29,30	-25.6/1919/26$_{SEUS}$
	Monthly **average** (°C)	4.1	7.4	4.8	
	No. of Frost-free days (Temp. > 0°C)	10	19	11.6	
DEGREE-DAYS	Monthly growing (5°C base)	74.6	120.1	63.7	
	Yearly total-to-date growing	1456.1	2019.5	1670.2	
	Monthly heating (18°C base)	431.1	329.7	410.2	
	Yearly total-to-date heating	4148.6	3922.5	4105.5	
	Monthly cooling (18°C base)	0.0	0.0	0.1	
	Yearly total-to-date cooling	74.2	257.4	119.1	
PRECIPITATION	Monthly total (mm)	26.1	11.5	16.4	69.8/1969$_{SRC}$
	Yearly total-to-date (mm)	390.8	250.6	315.1	
	Greatest 24-hr (mm/date)	8.2/18	7.7/26	36.7/1984/16	41.7/1924/12&1969/03$_{SESA}$
	Measurable precipitation days (≥ 0.2mm)	16	8	6.3	
WIND	Average monthly speed (km/h)	13.9	20.8	17.0	
	Peak gust (speed/direction/date)	69.3^{N}14	79.0^{WNW}23		138^{NW}1967/16$_{SA}$
RADIATION	Monthly bright sunshine (hours)	141.3	198.2	157.9	
	% possible bright sunshine	43.0	60.1	48.1	
	% normal bright sunshine	89.5	125.5		
	Bright Sunshine days	23	28	27.0	
	Monthly global radiation(MJ/m²)	220.4	257.2	239.1	
	Monthly diffuse radiation (MJ/m²)	99.0	90.1	92.6	
SOIL	Average temperature (°C) @ 9:00am — grass level	3.9	6.4		
	10 cm/20 cm	0.6/2.4	6.4/8.0	4.5/6.0	
	50 cm/100cm	5.0/5.5	9.0/9.9	8.0/9.2	
	150 cm/300cm	6.8/6.9	10.4/9.9	9.7/9.5	

Saskatoon Stations
SE= Eby (pioneer) 1901-41
SA= S'toon Airport 1942-
US= Univ. of SK 1915-64
SRC= SK Res. Council 1963-

Normals
Global and diffuse radiation = 1961-1990
Soil Temperatures = 1961-1990
Wind Normal and Extreme are from Saskatoon Airport

For Your Information

Dry, warm autumn weather continued into October raising gardeners' and farmers' hopes that there would be time to finish the harvest. This pleasant weather ended on the 12th with rain. After a brief respite on the 13th; snow and rain on the 14th put an end to any hope of completing fall chores. It snowed or rained for the next 10 days and then again for five days out of the last eight days of the month. The occurrence of precipitation on 16 days during October broke the old record of 14 days set in 1969 and 1991. With so much rainy/snowy weather, it is understandable that the bright sunshine hours and days were below normal. Temperatures during October ranged from 27.8°C on the 9th to -8.5°C on the 26th. On average, the monthly temperature was slightly below normal.

There are many ways of recording temperature but surely the most curious is the Yukon's "Sourdough Thermometer" of the 1880's. Four bottles were placed on an outside window ledge. The first bottle contained mercury which froze at -40°C; the second, coal oil which froze at -45°C; the third, an extract of Jamaica ginger which froze at -51°C and the fourth was "Perry Davis' Painkiller". This patent medicine was a concoction of alcohol and opium among other things. It turned white at -51°C; crystallized at -57°C and froze solid at -60°C. Stage drivers would not leave the roadhouses if the painkiller had started to crystallize.[1]

[1]Robb, Jim, n.d.

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SRC smart science solutions

Saskatchewan Research Council

Monthly Weather Summary

latitude 52°09'N Longitude 106°36'W asl 497 m Saskatoon

CRS estab. 1963

November 2004		2004 VALUE	2003 VALUE	NORMAL OR EXTREME FOR CRS 1971-2000	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly **maximum** (°C)	4.4	-3.7	-1.4	
	Extreme monthly maximum (°C/date)	14.8/15	5.4/16	19.4/1975/04	21.7/1903/03$_{SE}$
	Average monthly **minimum** (°C)	-5.8	-13.8	-10.3	
	Extreme monthly minimum (°C/date)	-13.6/28	-24.4/22	-33.5/1985/24	-39.4/1893/30$_{SM}$
	Monthly **average** (°C)	-0.7	-8.8	-5.9	
	No. of Frost-free days (Temp. > 0°C)	2	0	1.2	
DEGREE-DAYS	Monthly growing (5°C base)	4.4	0.0	2.6	
	Yearly total-to-date growing	1460.9	2019.5	1672.8	
	Monthly heating (18°C base)	561.6	804.0	715.8	
	Yearly total-to-date heating	4710.2	4726.5	4821.1	
	Monthly cooling (18°C base)	0.0	0.0	0.0	
	Yearly total-to-date cooling	74.2	257.4	119.1	
PRECIPITATION	Monthly total (mm)	0.7	3.9	14.8	57.3/1940$_{SE}$
	Yearly total-to-date (mm)	391.5	254.5	329.9	
	Greatest 24-hr (mm/date)	0.3/02	1.8/04	19.3/1978/04	27.9/1938/01$_{US}$
	Measurable precipitation days (≥ 0.2mm)	3	8	7.9	
WIND	Average monthly speed (km/h)	13.8	12.7	16.0$_{SA}$	
	Peak gust (speed/direction/date)	60.1^{NNW}22	50.1^{NW}05		100.0^{W}1976/17$_{SA}$
RADIATION	Monthly bright sunshine (hours)	129.5	146.0	98.0	
	% possible bright sunshine	49.2	55.2	37.2	
	% normal bright sunshine	132.1	149.0		
	Bright Sunshine days	29	27	22.2	
	Monthly global radiation(MJ/m^2)	127.7	150.6	123.7	
	Monthly diffuse radiation (MJ/m^2)	58.7	63.1	73.6	
SOIL	Average temperature (°C) @ 9:00am — grass level	-3.0	-11.4		
	10 cm/20 cm	-0.7/0.8	-4.5/-2.3	-1.7/-0.5	
	50 cm/100cm	2.3/4.9	1.3/5.1	2.8/5.4	
	150 cm/300cm	6.4/7.9	7.1/8.6	6.8/8.1	

Saskatoon Stations
SM=interrupted readings (NWMP) about 1892-1900
SE= Eby (pioneer) 1901-41
SA= S'toon Airport 1942-
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Normals
Global and diffuse radiation = 1961-1990
Soil Temperatures = 1961-1990
Wind Normal and Extreme are from Saskatoon Airport

For Your Information

Although the monthly average maximum and minimum temperatures for November were 5.8°C and 4.5°C above normal, respectfully, they did not set records for the highest average monthly temperatures. The monthly average maximum of 4.4°C tied 1999 for second place while the monthly average minimum of -5.8°C tied 1987 for the fourth highest minimum. The monthly average temperature of -0.7°C tied 2001 for third place. This month's precipitation of 0.7mm tied 1981 for the least amount measured since the station opened in 1963. The warm temperatures were reflected in the low heating degree-days; the fifth lowest at the station. Along with the pleasant temperatures and dry conditions, the bright sunshine was absent for only one day. Bright sunshine was recorded for 129.5 hours. Although this was 32% above normal, it was not close to the record of 188.5 hours set in 1976 when every day had some bright sunshine.

On November 7, 1885 at 9:22am, Canada was linked with a ribbon of steel from coast to coast as Donald Smith drove in the last spike of the CPRailroad at Craigellachie, BC. Although cloudy, the temperature was a mild 10°C.[1] [1]Phillips, 1988.

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Saskatchewan Research Council

Monthly Weather Summary

latitude 52°09'N Longitude 106°36'W asl 497 m Saskatoon

CRS estab. 1963

	December 2004	2004 VALUE	2003 VALUE	NORMAL OR EXTREME FOR CRS 1971-2000	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly **maximum** (°C)	-6.9	-3.0	-9.0	
	Extreme monthly maximum (°C/date)	11.0/03	6.6/20	11.2/1997/14	14.4/1939/05$_{SE}$
	Average monthly **minimum** (°C)	-16.2	-12.6	-18.6	
	Extreme monthly minimum (°C/date)	-29.7/23	-25.6/11	-42.2/1973/31	-43.9/1892/22$_{SM}$
	Monthly **average** (°C)	-11.6	-7.8	-13.9	
	No. of Frost-free days (Temp. > 0°C)	0	0	0.2	
DEGREE-DAYS	Monthly growing (5°C base)	0.0	0.0	0.1	
	Yearly total-to-date growing	1460.9	2019.5	1672.9	
	Monthly heating (18°C base)	917.1	800.7	987.7	
	Yearly total-to-date heating	5627.3	5527.2	5809.0	
	Monthly cooling (18°C base)	0.0	0.0	0.0	
	Yearly total-to-date cooling	74.2	257.4	119.1	
PRECIPITATION	Monthly total (mm)	13.0	3.2	18.3	59.2/1956$_{SA}$
	Yearly total-to-date (mm)	404.5	257.7	348.2	
	Greatest 24-hr (mm/date)	2.3/02	0.7/29	14.5/1973/23	28.4/1936/02$_{SE}$
	Measurable precipitation days (≥ 0.2mm)	16	7	11.4	
WIND	Average monthly speed (km/h)	15.2	12.2	16.0	
	Peak gust (speed/direction/date)	75.4^{WNW}19	54.1^{SSE}05		121^{W}1955/12$_{SA}$
RADIATION	Monthly bright sunshine (hours)	56.3	113.6	85.4	
	% possible bright sunshine	23.2	46.9	35.3	
	% normal bright sunshine	65.9	133.0		
	Bright Sunshine days	17	25	22.8	
	Monthly global radiation(MJ/m^2)	74.3	96.8	95.2	
	Monthly diffuse radiation (MJ/m^2)	53.5	43.3	54.3	
SOIL	Average temperature (°C) @ 9:00am — grass level	-9.5	-9.5		
	10 cm/20 cm	-4.9/-3.1	-5.6/-3.8	-6.5/-5.5	
	50 cm/100cm	-1.2/2.2	-1.6/1.8	-1.6/1.9	
	150 cm/300cm	4.1/6.3	4.0/6.6	3.9/6.3	

Saskatoon Stations
SM=interrupted readings (NWMP) about 1892-1900
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Normals
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Soil Temperatures = 1961-1990
Wind Normal and Extreme are from Saskatoon Airport

For Your Information

The first leap year of the new millennium ended with a December of above average temperatures. Seventeen days registered temperatures above -10°C with eight of those, above freezing. Although more than half of the month's days had precipitation, the the amount recorded was only 71% of normal. It fell, at times, as a mixture of snow and rain. The year ended with precipitation 16% above the annual norm. December was the fifth dullest month recorded since 1965 when bright sunshine measurements commenced at the station. Bright Sunshine lovers no doubt missed the extra 5 days of sunshine that normally occurs.

Winter is the height of heart attack season in Canada with admissions to hospitals for heart failure 25% higher than for other times of the year. A Saskatoon physician indicates Monday mornings appear to be the most common time for heart attacks. Freezing temperatures can constrict blood vessels which cause the heart to work harder when placed under a stress such as shoveling snow. Even for non-snow-shoveling people heart problems increase by 25% for those over 75 and 45% for those over 85 during the winter months.[1] Solution: Hiberate until March.

[1]Philips, 2003.

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INSTRUMENTS USED AT SASKATOON SRC CRS AND GLOSSARY OF TERMS

(Unless otherwise stated, source for definitions of terms is Environment Canada, 1978)

BEAUFORT WIND SCALE was developed by Admiral Sir Francis Beaufort in 1805 and adopted by the British Navy in 1838. It consisted of 13 degrees of wind strength, from calm to hurricane, based upon the effects of various wind strengths upon the amount of canvas carried by the fully rigged frigates of the period. Over the years it has been modified as needed and in 1946 the scale values (Force Numbers) were defined by ranges of wind speed as measured at a height of 10 meters above the surface. In effect, this transformed the 'Beaufort Wind Force Scale' into the 'Beaufort Wind Speed Scale'. This scale is the current standard scale for visual observations of the wind (Heidorn, 1998).

BRIGHT SUNSHINE is the unobstructed direct radiation from the sun, as opposed to the shading of a location by clouds or by other atmospheric obstructions.

Number of Days is defined as the total number of days when at least 0.1 of an hour of bright sunshine was recorded.

Percentage Possible refers to the ratio of measured bright sunshine hours to the total possible daylight hours in a given period, expressed as a percentage.

Possible daylight hours are taken from the sunrise/set tables provided by the National Research Council of Canada, Herzberg Institute of Astrophysics, Victoria, BC.

Total is the sum of the daily bright sunshine values in hours and tenths of hours as measured by an automated sunshine recorder using voltaic cells.

DEGREE-DAY is an index for various temperature related calculations

Cooling (CDD) is the cooling requirement to achieve a stipulated comfort value in an indoor environment. For most purposes, a temperature of greater than 18°C is considered uncomfortable and supplementary cooling is required. On a specific day, the amount by which 18°C is less than the daily average temperature defines the number of cooling degree-days for that day.

Mathematically:

CDD = (T - 18°C), for that day, where T = daily mean temperature in °C if T is equal to or less than 18°C, CDD = 0.

Monthly and annual values of CDD are obtained by summing daily values.

Growing (GDD) is the growing requirement in order for plant growth to proceed. The air temperature must exceed a critical value appropriate to the plant species in question. For many members of the grass family, including most commercial cereals grown on the prairies, a base temperature of 5.0°C has been established. On a specified day, the difference between the daily average temperature and the 5.0°C base temperature defines the number of growing degree-days.

Mathematically:

GDD = (T - 5.0°C), for that day, where T = daily mean temperature in °C if T is equal to or less than 5.0°C, GDD = 0.

Daily GDD values are summed to provide totals for the appropriate month, growing season or year.

Heating (HDD) is the heating requirement to achieve a stipulated comfort value in an indoor environment. For most purposes, a temperature of less than 18°C is considered uncomfortable and supplementary heating is required. On a specific day, the amount by which 18°C exceeds the daily average temperature defines the number of heating degree-days for that day.

Mathematically:

HDD = (18°C - T), for that day, where T = daily mean temperature in °C if T is equal to or greater than 18°C, HDD = 0.

Monthly and annual values of HDD are obtained by summing daily values.

EXTREME is the highest or lowest value of a particular element recorded during the period in question.

EXTREME ALL YEARS Temporal comparisons at a point are also of value in some types of climatic studies. Therefore, it is desirable to produce the maximum length of reliable climatic record to carry out studies over a period of time. Data are drawn from the following data sets:

Saskatoon, SRC:1963 to present
Saskatoon, University of Saskatchewan:1916 to 1963
Saskatoon, City:1892 to present

Station locations, exposures and measurement procedures were subject to change during this time period. Data are not adjusted and users are cautioned accordingly.

FROST is recorded on each occasion when the daily minimum temperature is equal to or less than 0°C.

NORMAL VALUE (1971-2000) In climatology it is often useful to make spatial comparisons of particular element values over a common time period. At an interior continental site such as Saskatoon, a period of 30 years is required to produce statistically stable estimates of the more variable elements. To facilitate spatial comparisons, the World Meteorological Organization recommends the standard normal (average) period of thirty years. The current normal period for data analysis is from January 1st, 1971 to December 31st, 2000. Data derived from CRS conform to this standard, except where noted. The normals for CRS have been calculated using the data collected during this standard period. Where gaps existed, data from the nearest climate station were used and referenced as to being used.

POTENTIAL EVAPOTRANSPIRATION (Thornthwaite Method) is the amount of water which will be lost from a surface completely covered with vegetation if there is sufficient water in the soil at all times for the use of the vegetation. It is computed by means of an empirical formula involving mean monthly temperature and average length of day.

Mathematically:

PET = mT^a where PET = Potential of Evaportranspiration; m = % of day length for the month as compared to the year; T = Temperatue °C when T is less than or equal to 0; otherwise T = O; and a = yearly heat index. (Thornthwaite& Mather 1955)

PRECIPITATION

Day is recorded on occasions when the amount of precipitation in a 24-hour period equals or exceeds 0.2 mm water. An asterisk (*) appearing in the average column denotes the occurrence of measurable precipitation on one or more occasions, and that the calculated 30-year average amounts to less than a trace. The so-called climatological day, beginning at 9 a.m. standard time on the date of reference and ending at 9 a.m. the next morning, was employed in record keeping up to January 1994. On February 1, 1994, after consultation with Environment Canada, record keeping was changed to the 24-hour period of 0000 hours - 2400 hours to conform to their reporting of climatological statistics.

Total is the sum of the daily recorded precipitation. The snowfall component of precipitation is recorded as an equivalent amount of liquid water. For particulars on precipitation measurement procedures and instruments, the reader is referred to the Environment Canada publication "*Manual of Climatological Observation's*", 2nd Ed., January, 1978. The notation "T" refers to a trace of precipitation (less than 0.2 mm water equivalent). As of August 7, 1993, total precipitation was measured using the Belfort weighing gauge for the winter season and the tipping bucket during frost-free period.

SOIL TEMPERATURE under a short grass surface with normal snow accumulation, is measured according to procedures outlined in the Environment Canada publication "*Soil Temperature*" January 1, 1976. Depths below surface at which soil temperature measurements are made are: 5 cm, 10 cm, 20 cm, 50 cm, 100 cm, 150 cm and 300 cm. Since soil temperature is affected by profile structure and water content, extrapolation of the measured data is difficult.

SOLAR RADIATION

Diffuse - Total is radiation reaching the earth's surface after having been scattered from the direct solar beam. The instrument used is an Eppley pyranometer with a shade ring (See SOLAR RADIATION-Global- Total).

Global - Total is the sum of the direct solar and diffuse radiation during the period in question. Measurements are carried out on a horizontal surface near ground level and integrated over the whole celestial dome, summing the diffuse and direct components of the solar beam. The temperature-compensated Eppley pyranometer is used. The standard metric unit of measurement is the megajoule per square metre (MJ/m^2). (To facilitate comparison with past years' data: 1.0 MJ/m^2 = 23.895 langleys). Comparison is provided with a provisional average based on 16 years of data (1975-1990).

SPELLS - Temperature spells are defined as a sequence of days when the daily maximum temperature is higher than or equal to 30°C (hot spell) or the daily minimum temperature is lower than or equal to -30°C (cold spell).

SUNRISE/SUNSET times have been included in this report. They have been acquired from the National Research Council, Canada, Herzberg Institute of Astrophysics.

TEMPERATURE

Average Annual is the average of the daily average temperatures in degrees Celsius (°C) for one year.

Average Daily is defined as the arithmetic mean of the daily maximum temperature in degrees Celsius (°C) and the daily minimum temperature in degrees Celsius (°C) for the day in question.

Average Maximum is the average of the daily maximum temperatures in degrees Celsius (°C) average over the appropriate time periods. For details concerning measurement procedures, the reader is referred to the Environment Canada publication, "*Manual of Climatological Observations*", 2nd Ed., January, 1978.

Average Minimum is the average of the daily minimum temperatures in degrees Celsius (°C) averaged over the appropriate time periods. Refer to TEMPERATURE-Average Maximum concerning measurement procedures.

Average Monthly is the average of the daily average temperatures in degrees Celsius (°C) for the month under consideration.

WIND CHILL describes a sensation, the way we feel as a result of the combined cooling effect of temperature and wind. This feeling can't be measured using an instrument, so a mathematical formula was developed in 1939 that related air temperature and wind speed to the cooling sensation. This formula was revised in 2001 by a team of scientists and medical experts from Canada and the U.S. with the Canadian Department of National Defence contributing human volunteers. The new index is based on the loss of heat from the face (Environment Canada 2001a).

WIND SPEED

Average is the average of the hourly wind speeds for the period in question measured in kilometres per hour (km/h). Average hourly wind speeds are obtained from a RM Young Wind Monitor anemometer at a height of 10 m.

Peak Gust refers to the highest instantaneous value recorded by the anemometer system for the period of reference, irrespective of direction and/or duration. Comparison is with published data for Environment Canada, Saskatoon Airport station.

see also **Beaufort Wind Scale**

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